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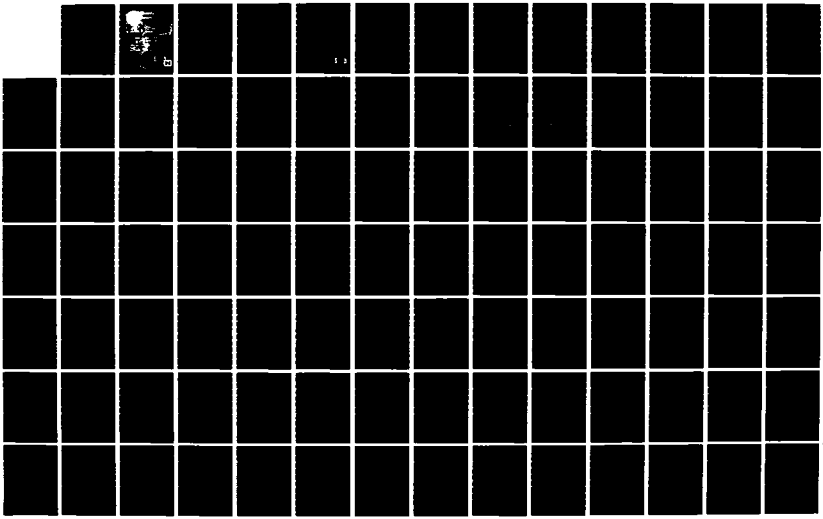

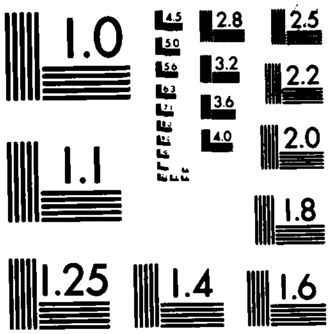

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MIDDLE BLACK WARRIOR AND LOWER TOMBIGBEE RIVERS

WARRIOR AND DEMOPOLIS LAKES

JULY 1978 - OCTOBER 1979

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Warrior Lake	Pesticides	Tombigbee River
Demopolis Lake	Plankton	Alabama
Nutrients	Benthos	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The U.S. Army Corps of Engineers, Mobile District, contracted Harmon Engineering & Testing of Auburn, Alabama, to perform a Water Quality Management Study of the Middle Black Warrior and Tombigbee River System (Contract No. DACW01-78-0181). The study began in July 1978, and samplings were made approximately every six weeks through October 1979, for a total of thirteen (13) samplings. Physical-chemical water quality parameters including in-situ parameters such as temperature and dissolved oxygen were measured along with anions, cations, and heavy metals. Sediment samples were analyzed for grain size, pesticides,

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herbicides, oil and grease, organic matter and heavy metals. Biological parameters monitored included fecal bacteria, phytoplankton, zooplankton, macroinvertebrates and aquatic macrophytes. Algal nutrient limitation was evaluated using the U. S. EPA Algal Assay Bottle Test.

The physical-chemical water quality of the Middle Black Warrior and Tombigbee River evidenced no levels of monitored constituents which would be considered severe or environmentally degrading. The river and reservoirs exhibited only very minor seasonal stratification. Seasonal variation in certain constituents most notably suspended matter, nutrients and some anions, was observed and resulted primarily through increased discharge due to rainfall. Aquatic biota was observed to be relatively diverse and indicative of moderate to good biological water quality.

WATER QUALITY MANAGEMENT STUDIES
MIDDLE BLACK WARRIOR AND LOWER TOMBIGBEE RIVERS
WARRIOR AND DEMOPOLIS LAKES
July 1978 - December 1979

Prepared under Contract No. DACW01-78-C-0181
By:
Harmon Engineering and Testing Company, Inc.

Auburn Industrial Park
Auburn, Alabama 36830

For Further Information Contact:

U. S. Army Corps of Engineers
Environmental Quality Section
P. O. Box 2288
Mobile, Alabama 36628

April 1983

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ABSTRACT

The U.S. Army Corps of Engineers, Mobile District contracted Harmon Engineering & Testing of Auburn, Alabama, to perform a Water Quality Management Study of the Middle Black Warrior and Tombigbee River System (Contract No. DACW01-78-0181). ~~The~~ study began in July 1978, and samplings were made approximately every six weeks through October 1979, for a total of thirteen (13) samplings. Physical-chemical water quality parameters including in-situ parameters such as temperature and dissolved oxygen were measured along with anions, cations, and heavy metals. Sediment samples were analyzed for grain size, pesticides, herbicides, oil and grease, organic matter and heavy metals. Biological parameters monitored included fecal bacteria, phytoplankton, zooplankton, macroinvertebrates and aquatic macrophytes. Algal nutrient limitation was evaluated using the U.S. EPA Algal Assay Bottle Test.

The physical-chemical water quality of the Middle Black Warrior and Tombigbee River evidenced no levels of monitored constituents which would be considered severe or environmentally degrading. The river and reservoirs exhibited only very minor seasonal stratification. Seasonal variation in certain constituents, most notably suspended matter, nutrients and some anions, was observed and resulted primarily through increased discharge due to rainfall. Aquatic biota was observed to be relatively diverse and indicative of moderate to good biological water quality.

EXECUTIVE SUMMARY

The Water Quality Management Study of the Middle Black Warrior and Tombigbee River basins (Contract No. DACW01-78-0181) indicated that this dual river basin, which includes the reservoirs impounded by Warrior Lock and Dam and Demopolis Lock and Dam, had no physical, chemical or biological water quality conditions which would be considered environmentally degrading. This indication resulted from an eighteen (18) month water quality survey conducted at twenty-three (23) stations throughout the two river basins. The following sections provide a synopsis of the study and the results and conclusions obtained.

STUDY AREA

The Middle Black Warrior and Tombigbee River System includes the Black Warrior River from Oliver Lock and Dam at Tuscaloosa to its confluence with the Tombigbee River near Demopolis. The Tombigbee River section considered in this study began at Gainesville Dam and continued to Demopolis Lock and Dam. There were sixteen (16) monitoring stations on the Black Warrior River, five (5) on the Tombigbee River and two (2) in Demopolis Lake. Additionally, twelve (12) major tributary streams were monitored, along with six (6) municipal and industrial discharges.

ANALYSES AND ANALYTICAL METHODS

Throughout the study, approximately one hundred (100) different parameters were measured and analyzed. These included physical measurements, in-situ chemical measurements, laboratory analyses, biological specimen collection, identification and enumeration and field observation of aquatic plants. Each different segment of the study was performed according to methodologies agreed upon by the U.S. Army Corps of Engineers, Mobile District. Laboratory quality control procedures were used to maintain the validity of the analytical results.

Physical measurements were temperature and light penetration. In-situ chemical measurements were performed for pH, specific conductance, dissolved oxygen and oxidation reduction potential. Laboratory parameter included a full range of anions, nutrients and heavy metals. Biological parameters were fecal bacteria, phytoplankton, zooplankton, macroinvertebrates and aquatic macrophytes.

In addition to routine collection of water quality data, several other investigations were performed. Sediments were collected for physical-chemical analyses. The in-situ chemical measurements were used to monitor for stratification, tributary and discharge quality and the water quality effect of operating Warrior Lock.

RESULTS

In-situ analysis showed that the Middle Black Warrior and Tombigbee River basin were relatively warm (9^o - 31^oc) and well oxygenated (surface dissolved oxygen levels >5.0 mg/ℓ). Specify conductance varied between the two basins, with the Tombigbee River having lower conductivities ($\bar{\chi}$ = 125 µmhos/cm) than the Black Warrior River ($\bar{\chi}$ = 175 µmhos/cm). Clarity, as measured by color, turbidity, and light transmittance and Secchi depth was generally greater in the Black Warrior River than the Tombigbee River and Demopolis Lake. This was attributable to higher turbidities and suspended solids in the Tombigbee River.

The chemical constituents of the two rivers showed varying concentrations when the study period averages are compared. Dissolved solids and the constituents varying slightly between the two river basins. The Black Warrior River had lower study period averages for alkalinity, calcium, magnesium and chlorides than did the Tombegbee River. However, the Black Warrior River had greater levels of magnesium, potassium and sodium which lead to higher total EDTA hardness and dissolved solids than occurred in the Tombigbee River. Sulfates averaged the highest levels in the Black Warrior River and sulfides were equal in both basins. Inorganic nitrogen forms were highest in the Black Warrior River while the Tombigbee River had the highest levels of organic nitrogen. Both total and dissolved phosphorus forms were highest in the Tombigbee River. Iron was more prevalent in the Tombigbee River; mangenese and zinc had their highest levels in the Black Warrior River. These results indicate that while results vary between the basins the range of variation is not tremendous (many parameters showed less than 50% variation) and no constituent poses any environmental hazard.

Biological analyses showed relatively equal numbers and diversity within the major categories studied. Phytoplankton, zooplankton and macroinvertebrates were observed to fluctuate with the seasons. Additionally, the plankton samples from Warrior Lake and Demopolis Lake showed some variations in total numbers which indicated that impoundment had some affect on production as compared to the more free flowing sections of the study area. The microbiological parameters indicated that there as a degree of fecal pollution entering the river system and the Tombigbee River showed greater levels of fecal bacteria.

Sediment analyses revealed that the two river basins had some measurable quantities of sediment-associated pollutants. Organic matter, oil and grease and nutrients did not appear to be excessively high at any of the stations monitored. Heavy metals, especially toxic metals such as cadmium, chromium, and nickel occassionally showed elevated levels, particularly below Oliver Lock and Dam and Warrior Lock and Dam. If future waterway maintenance requires dredging in these areas, special sediment quality evaluations may be necessary.

The Middle Black Warrior and Tombigbee River System evidenced very little seasonal stratification in temperature and dissolved

oxygen. The majority of stratification monitoring data indicate that both rivers present a nearly homogenous thermal and chemical profile for in-situ parameter. The lack of extensive horizontal stratification indicates that the river mixes well and that the assimilative capacity for municipal and industrial discharges was quite high.

CONCLUSIONS AND RECOMMENDATIONS

The Water Quality Management Study of the Middle Black Warrior and Tombigbee Rivers indicated that no excessive pollution was adversely affecting the water quality within the study area. Water and sediment quality and aquatic biota all appeared to be within tolerable limits. It was recommended that in the future fewer water quality monitoring stations could be established and trends in water quality could be assessed from the baseline data of this study. The implementation of such an approach, would provide a continuous record of water quality before and after completion of the Tennessee-Tombigbee Waterway.

SECTION 1

INTRODUCTION

The United States Army Corps of Engineers, Mobile District (COE) has undertaken a water quality management study for the Middle Black Warrior and Tombigbee Rivers, including Warrior Lake and Demopolis Lake. Harmon Engineering & Testing Company (HE&T) was contracted by the COE (Contract DACW01-78-C-0181) to perform the required sampling, analyses and reporting for those impoundments.

1.1 PROJECT DESCRIPTION

1.1.1 Black Warrior River

The Black Warrior River is formed by the junction of Mulberry Fork and Locust Fork about 20 miles west of Birmingham, Alabama, on the Cumberland Plateau (Figure 1-1). It flows southwesterly for 174 miles through the Coastal Plain to join the Tombigbee River at Demopolis, Alabama. The river basin is the largest in Alabama with a drainage area of 6300 square miles covering all or part of sixteen counties (AWIC, 1976).

After exiting the Warrior Coal Basin north of Tuscaloosa, the river enters the study area considered in this report. This study area begins at Tuscaloosa, immediately downstream of William B. Oliver Lock and Dam (Figure 1-2). Tuscaloosa is in the Fall Line Hill Subdivision of East Gulf Coastal Plain. Near Eutaw, Alabama, the river flows into the Black Prairie Belt, which is characterized by chalk deposits of various types, and remains in this physiographic region until its end at Demopolis. Downstream of Tuscaloosa, the river averages a drop of 0.5 feet per mile and has steep, high banks.

The Black Warrior River is impounded 261.1 miles above Mobile (50 miles above the confluence with the Tombigbee River) by Warrior Lock. The Warrior reservoir covers 7,800 acres at a normal pool elevation of 95.0 feet above mean sea level (MSL) and extends 77 miles upstream to William Bacon Oliver Lock and Dam creating approximately 300 miles of shoreline. The drainage area above Warrior Lock and Dam is 6,280 square miles. The river had an average flow (1932-1955) of 8,766 cubic feet per second (cfs) and had a minimum mean monthly flow in October 1935 of 177 cfs and a maximum mean monthly flow of 44,610 in February, 1956 (U.S. Army Corps of Engineers, Mobile District, July 1975).

1.1.2 Tombigbee River

The Tombigbee River originates in northeast Mississippi and flows through the Black Prairie Belt to its confluence with the Black Warrior River at Demopolis (Figure 1-1). The river continues to the confluence of the Alabama River where it forms the Mobile River which flows into Mobile Bay. The total drainage area above Demopolis Lock and Dam is 15,400 square miles (includes Black Warrior and Tombigbee River basins).

FIGURE 1-1. Geographic Location of the Study Area for the Water Quality Management Study, Middle Black Warrior and Tombigbee Rivers, July 1978 thru October 1979.

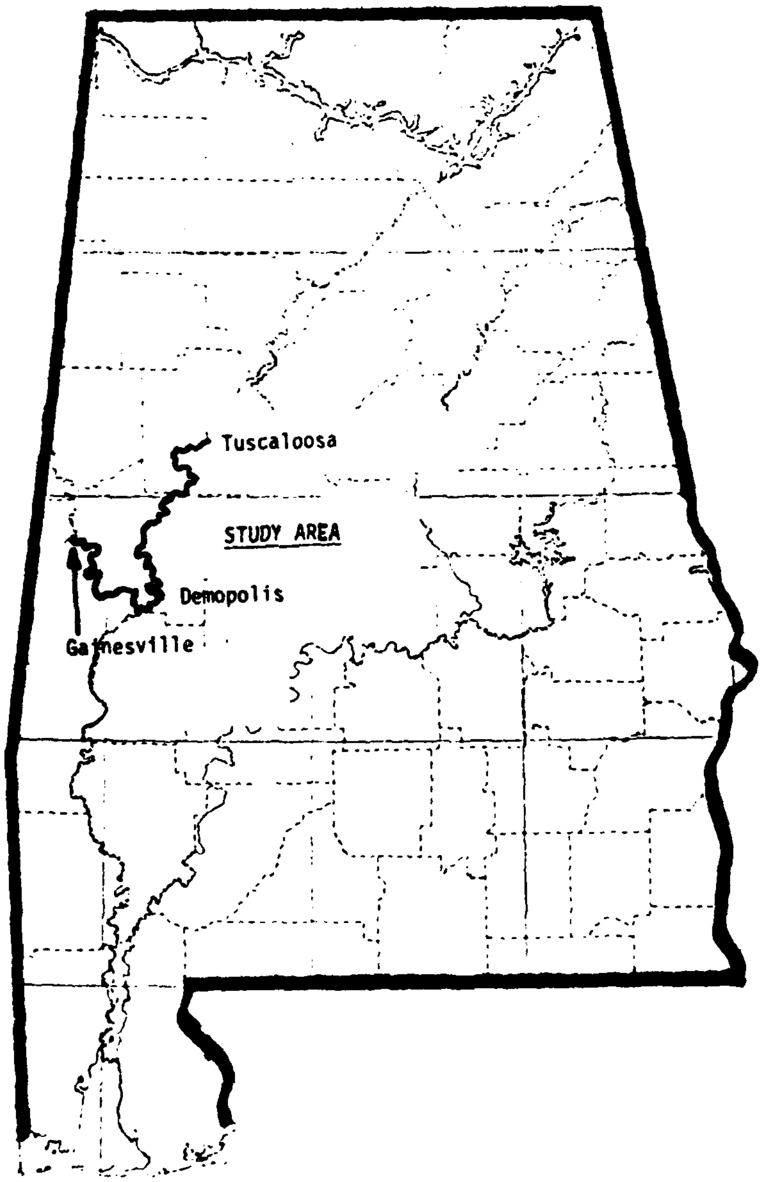
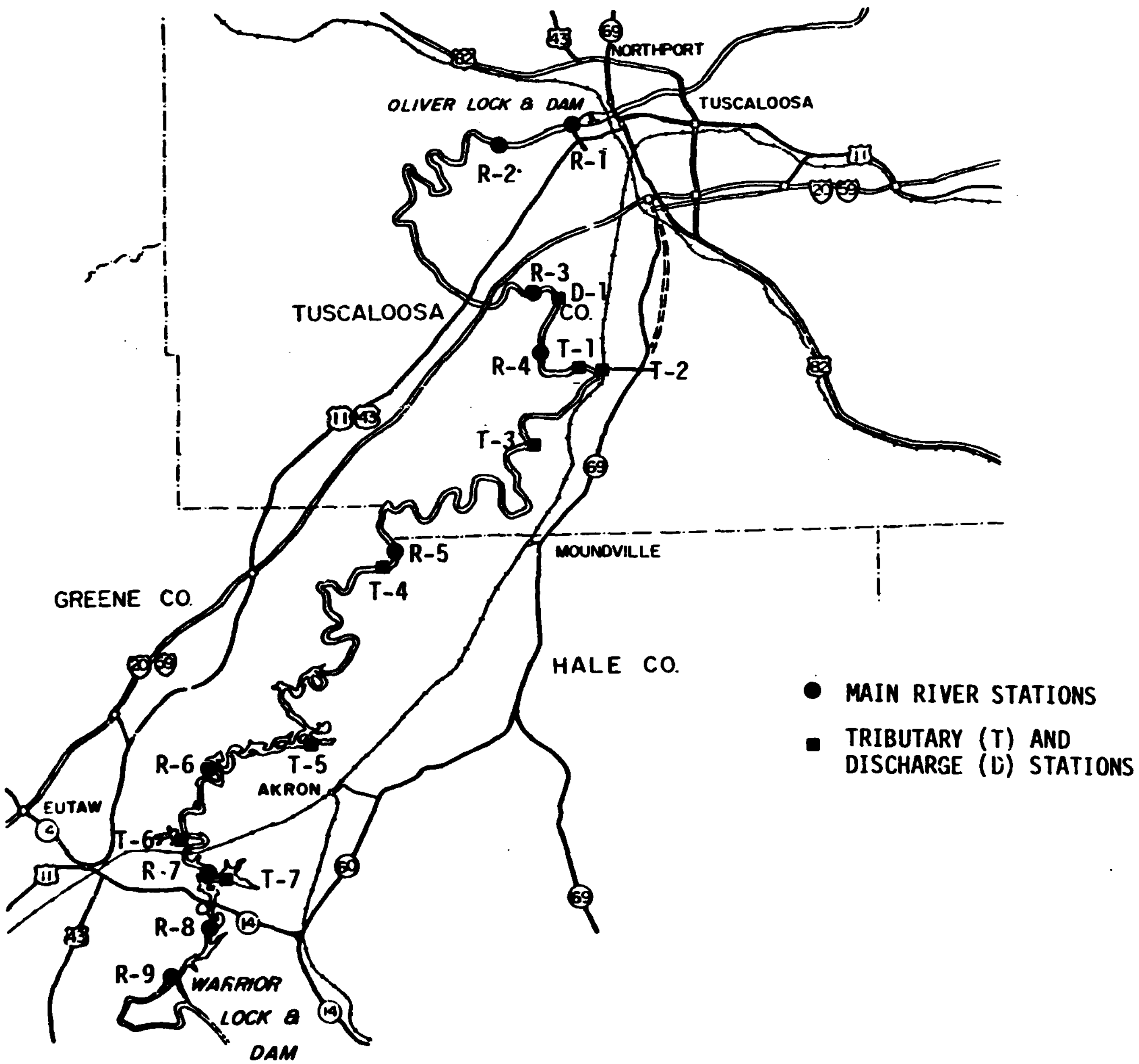


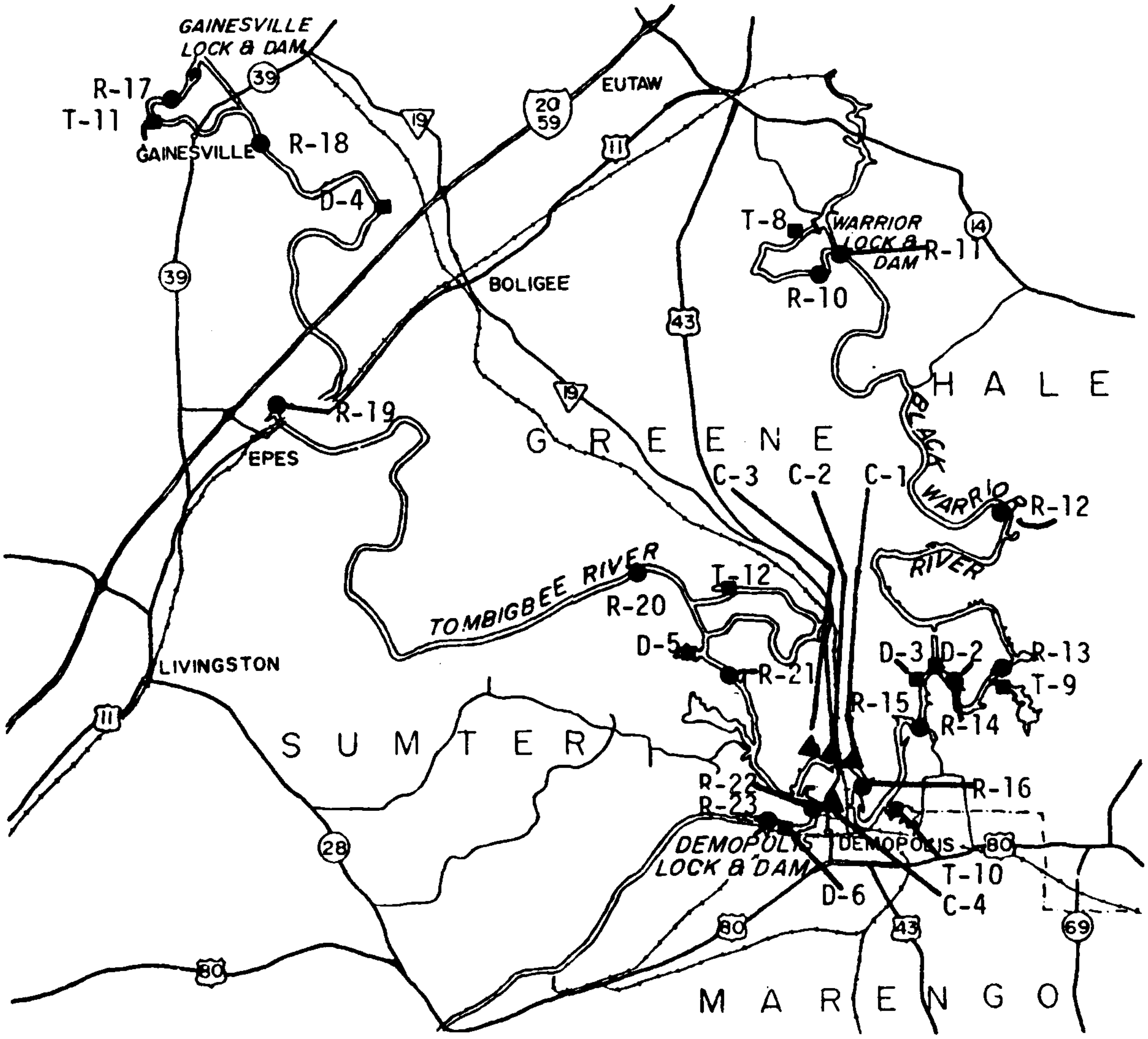
FIGURE 1-2. Locations of Sampling Stations for the Water Quality Management Study, Middle Black Warrior and Tombigbee Rivers, Warrior Lake Section, July 1978 thru October 1979



R-1 thru R-5 = Upper Warrior Lake

R-6 thru R-9 = Lower Warrior Lake

FIGURE 1-3. Locations of Sampling Stations for the Water Quality Management Study, Middle Balck Warrior and Tombigbee Rivers, Lower Black Warrior River, Tombigbee River and Demopolis Lake Sections, July 1978 thru October 1979.



● MAIN RIVER STATIONS

■ TRIBUTARY (T) AND DISCHARGE (D) STATIONS

▲ BACTERIOLOGICAL STATION

R-10 thru R-16 = Lower Black Warrior River

R-17 thru R-21 = Tombigbee River

R-22 thru R-23 = Demopolis Lake

The study area on the Tombigbee River extends from Gainesville Lock and Dam for 52 miles downstream to Demopolis Lock and Dam forming Demopolis Lake (Figure 1-3) which is impounded 213.2 miles above Mobile. The reservoir has a normal operating pool of 73 feet MSL. At this elevation the reservoir covers 10,000 acres, has 500 miles of shoreline and provides navigable depths to Gainesville Lock and Dam on the Tombigbee River and Warrior Lock and Dam on the Black Warrior River. Demopolis Lake had a mean flow (1928 to 1967) of 22,100 cfs; minimum monthly flow was 753 cfs in August 1954; maximum monthly flow was 116,000 cfs in March 1929 (U.S. Army Corps of Engineers, Mobile District, February 1979).

1.2 OBJECTIVES

The objectives of the water quality management study on the described sections of the Middle Black Warrior and Tombigbee Rivers were:

- To establish base-line conditions for further comparisons
- To identify water quality-environmental problems
- To collect data to allow guidance for reservoir control-discharge water quality relationships
- To collect data that will provide an adequate data base and understanding of project conditions to facilitate coordination with state agencies to implement watershed pollution control.

1.3 SAMPLING LOCATIONS

Figure 1-1 illustrates the general geographic location of Black Warrior and Tombigbee Rivers and the study area. Station locations for the study are shown on Figures 1-2 and 1-3.

Table 1-1 provides a listing of the main river sampling station locations of this project. Included are the STORET station codes, river miles, and brief descriptions of the station locations. The division of the table into the Black Warrior River, Tombigbee River and Demopolis Lake will facilitate discussion in later sections of this report. Table 1-2 shows similar information for the discharge and tributary stations. Table 1-3 presents the bacteriological sampling station locations.

The two river basins have been grouped into four river sections to facilitate discussion of water quality trends. Thus, the Black Warrior River has been divided and the sections designated Warrior Lake and the Lower Black Warrior River. The Tombigbee River and Demopolis Lake are the remaining sections. These section designations are fully described in Section 3 of this report.

1.4 SAMPLING SCHEDULES

Table 1-4 presents a summary of the dates and sampling trips. Table 1-5 compares the main river stations to the parameters to be analyzed. Table 1-6 presents the analytical schedule for the study.

Table 1-1. Location and Description of Main River Sampling Stations on Middle Black Warrior-Tombigbee Rivers, July 1978 through October 1979.

COE Station Number	Station STORET Code	River Mile	Station Description
BLACK WARRIOR RIVER			
R- 1	4179	337.6	Below W.B. Oliver Lock and Dam
R- 2	4176	334.2	Above Potato Creek
R- 3	4173	317.2	Above Nelson's Bar
R- 4	4169	314.6	Alabama Power Co. (APCO) cable
R- 5	4166	293.3	Old Lock #9 at black buoy
R- 6	4242	274.8	Above Merriweather Landing at black buoy
R- 7	4159	266.8	At red buoy
R- 8	4156	264.5	Jennings Ferry at red ouoy
R- 9	4153	262.0	Above Warrior Dam (1000 feet)
R-10	4149	261.0	Tailrace 1 mile above confluence *
R-11	4242	260.9	Below Warrior Lock
R-12	4146	245.2	Withers Landing
R-13	4143	232.0	Old Lock #5 at red buoy
R-14	4139	228.8	Above APCO Plant
R-15	4136	226.2	Above Yellow Creek
R-16	4133	219.4	Above U.S. Hwy. 43 at red buoy
TOMBIGBEE RIVER			
R-17	3123	279.0	Above Woodward Lake confluence
R-18	3119	273.7	Above Tubbs Creek
R-19	3116	257.8	Above Factory Creek
R-20	3313	236.2	Above Acron Creek
R-21	3109	221.0	Below Rattlesnake Bend cut-off
DEMOPOLIS LAKE			
R-22	3106	216.2	At black buoy
R-23	3103	213.6	Demopolis Dam warning sign at bouy

* in the Black Warrior River and Warrior Dam tailrace

Table 1-2. Location and Description of Tributary (T) and Discharge (D) Stations on Middle Black Warrior and Tombigbee Rivers, July 1978 Through October 1979.

COE Station Number	STORET Station Code	River Mile	Station Description
	BLACK WARRIOR RIVER		
D- 1	4275	316.5	Below Tuscaloosa STP*discharge
T- 1	4272	312.3	Big Cypress Creek
T- 2	4268	312.0	Little Sandy Creek
T- 3	4265	307.1	Big Sandy Creek
T- 4	4262	293.0	Elliots Creek
T- 5	4258	279.4	Five Mile Creek
T- 6	4255	269.5	Minters Creek
T- 7	4252	266.4	Big Brush Creek
T- 8	4248	N/A	White Creek below Warrior Dam
T- 9	4245	231.0	Big Praire Creek
D- 2	4238	228.2	Mwth of APCO discharge channel
D- 3	4235	228.0	APCO pond discharge
T-10	4232	222.8	French Creek
	TOMBIGBEE RIVER		
T-11	3225	278.0	Noxubee River
D- 4	3222	265.5	Sumter Sand and Gravel Co. discharge
T-12	3218	231.4	McConnico Creek
D- 5	3215	222.6	River's City Industry
D- 6	3212	214.2	Borden Chemical Company

* STP = Sewage Treatment Plant

Table 1-3. Location and Description of Bacteriological Sampling Stations on Middle Black Warrior and Tombigbee Rivers, July 1978 Through October 1979.

COE Station Number	STORET Station Code	River Mile	Station Description
BLACK WARRIOR RIVER			
C-1	4301	219.2	Creek above U.S. Hwy 43-50' from pier
C-2	4304	218.5	Runaway Creek #1 - 50' from shore
C-3	4307	218.5	Runaway Creek #2 - 50' from shore
C-4	4311	216.1	Unknown Creek at U.S. Hwy 43

Table 1-4. Sampling Trips and Dates, Middle Black Warrior and Tombigbee Rivers, July 1978 through October 1979.

1978	
Trip 1	July 30-August 4
Trip 2	August -September 1
Trip 3	October 1-5
Trip 4	December 10-14
1979	
Trip 5	February 28-March 2
Trip 6	May 14-16
Trip 7	June 17-20
Trip 8	July 27-August 1
Trip 9	August 26-28
Trip 10	October 1-3

Table 1-5. Parameters to be Analyzed on Selected Stations, Middle Black Warrior and Tombigbee Rivers, July 1978 to October 1979.

Station Number	In-Situ and Turbidity	Physical Chemical	Cross Section	Bacterio-logical	AGP	Sediment Samples	Phyto- and Zoo-Plankton	PONAR	Multiple Plate Samples
R-1	x	x		x		x	x	x	
R-2	x	x		x	x	x	x	x	
R-3	x	x		x		x	x	x	
R-4	x	x		x		x	x	x	
R-5	x	x		x	x	x	x	x	x
R-6	x	x		x		x	x	x	x
R-7	x	x		x		x	x	x	x
R-8	x	x	x	x		x	x	x	x
R-9	x	x		x	x	x	x	x	x
R-10	x	x		x		x	x	x	
R-11	x				x				
R-12	x	x		x		x	x	x	
R-13	x	x		x		x	x	x	x
R-14	x	x		x		x	x	x	
R-15	x	x		x	x	x	x	x	
R-16	x	x		x		x	x	x	x
R-17	x	x		x	x	x	x	x	
R-18	x	x		x		x	x	x	
R-19	x	x		x		x	x	x	
R-20	x	x		x		x	x	x	
R-21	x	x		x	x	x	x	x	
R-22	x	x	x	x		x	x	x	x
R-23	x	x		x	x	x	x	x	x

Note: Discharge and Tributary stations were analyzed for In-situ parameters plus turbidity.

Table 1-6. Analytical Schedule for the Middle Black Warrior and Tombigbee Rivers, July 1978 through October 1979.

PARAMETER	Trip 1*	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10
I. Water Sampling										
A. IN-SITU										
Temperature	x	x	x	x	x	x	x	x	x	x
Dissolved Oxygen	x	x	x	x	x	x	x	x	x	x
pH	x	x	x	x	x	x	x	x	x	x
Specific Conductance	x	x	x	x	x	x	x	x	x	x
Oxidation Reduction Potential	x	x	x	x	x	x	x	x	x	x
B. PHYSICAL-CHEMICAL										
Transparency	x	x	x	x	x	x	x	x	x	x
% Light Transmission	x	x	x	x	x	x	x	x	x	x
Turbidity	x	x	x	x	x	x	x	x	x	x
Residue, Non-filterable	x	x	x	x	x	x	x	x	x	x
Residue, Filterable	x	x	x	x	x	x	x	x	x	x
Nitrate + Nitrate	x	x	x	x	x	x	x	x	x	x
Ammonia	x	x	x	x	x	x	x	x	x	x
Total Kjeldahl Nitrogen	x	x	x	x	x	x	x	x	x	x
Nitrogen, Total Organic (Calc.)	x	x	x	x	x	x	x	x	x	x
Nitrogen, Total Inorganic (Calc.)	x	x	x	x	x	x	x	x	x	x
Nitrogen, Total (Calc.)	x	x	x	x	x	x	x	x	x	x
Phosphorus, Total	x	x	x	x	x	x	x	x	x	x
Orthophosphate, Dissolved	x	x	x	x	x	x	x	x	x	x
Alkalinity (pH 4.5)	x	x	x	x	x	x	x	x	x	x
Free CO_2 (Calc.)	x	x	x	x	x	x	x	x	x	x
Carbon, Total Organic	x	x	x	x	x	x	x	x	x	x
Carbon, Dissolved Organic	x	x	x	x	x	x	x	x	x	x
Color, True	x	x	x	x	x	x	x	x	x	x
Iron, Total	x	x	x	x	x	x	x	x	x	x
Iron, Dissolved	x	x	x	x	x	x	x	x	x	x
Manganese, Total	x	x	x	x	x	x	x	x	x	x
Manganese, Dissolved	x	x	x	x	x	x	x	x	x	x
Sulfate, Dissolved	x	x	x	x	x	x	x	x	x	x
Sulfide, Total	x	x	x	x	x	x	x	x	x	x
Calcium,Total		x			x				x	
Magnesium, Total		x			x				x	
Hardness (Calc.)		x			x				x	
Sodium, Total		x			x				x	
Chloride, Total		x			x				x	
Potassium, Total		x			x				x	
Zinc, Total	x	x	x	x	x	x	x	x	x	x

* See Table 1-4 for trip dates

Table 1-6. Analytical Schedule for the Middle Black Warrior and Tombigbee Rivers, July 1978 thru October 1979 (Continued)

PARAMETER	Trip 1*	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10
C. BACTERIOLOGICAL										
Fecal Coliform (F.C.)	x	x	x	x	x	x	x	x	x	x
Fecal Streptococci (F.S.)	x	x	x	x	x	x	x	x	x	x
F.C./F.S. Ratio	x	x	x	x	x	x	x	x	x	x
II. SEDIMENT SAMPLING										
A. GRAIN SIZE		x							x	
B. PHYSICAL-CHEMICAL										
Volatile Solids		x							x	
Carbon, Total Organic		x							x	
TKN		x							x	
Oil and Grease		x							x	
Phosphorus, Total		x							x	
C. HEAVY METALS										
Copper, Total		x							x	
Iron, Total		x							x	
Lead, Total		x							x	
Manganese, Total		x							x	
Mercury, Total		x							x	
Cadmium, Total		x							x	
Nickel, Total		x							x	
Zinc, Total		x							x	
Arsenic, Total		x							x	
Chromium, Total		x							x	
D. CHLORINATED HYDROCARBONS										
BHC, Alpha		x								
BHC, Gamma (Lindane)		x								
BHC, Beta		x								
Heptachlor		x								
Aldrin		x								
Pentachlorophenol		x								
DDD		x								
DDE		x								
DDT		x								
Mirex		x								
Methoxychlor		x								
Chlordane		x								
Toxaphene		x								
PCB (1242, 1254, 1260)		x								
Dieldrin		x								

* See Table 1-4 for trip dates

Table 1-6. Analytical Schedule for the Middle Black Warrior and Tombigbee Rivers, July 1978 thru October 1979 (Continued)

PARAMETER	Trip 1*	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8	Trip 9	Trip 10
III. BIOLOGICAL SAMPLING										
Phytoplankton	x	x	x	x	x	x	x	x	x	x
Zooplankton	x	x	x	x	x	x	x	x	x	x
Macrophytes		x							x	
Macroinvertebrates										
PONAR		x		x		x	x	x	x	
Multiple Plate Samples			x		x		x			x
Algal Growth Potential Test			x			x			x	
Adenosine Triphosphate	x	x	x	x	x	x	x	x	x	x
Chlorophyll a, b, c	x	x	x	x	x	x	x	x	x	x
IV. MOLLUSK TISSUE ANALYSES**										
Arsenic, Total		x			x				x	
Cadmium, Total		x			x				x	
Chromium, Total		x			x				x	
Lead, Total		x			x				x	
Mercury, Total		x			x				x	
Selenium, Total		x			x				x	
Zinc, Total		x			x				x	
Aldrin		x			x				x	
Dieldrin					x				x	
Chlordane		x			x				x	
Heptachlor		x			x				x	
BHC, Alpha		x			x				x	
BHC, Gamma (Lindane)		x			x				x	
BHC, Beta		x			x				x	
PCB (1242, 1254, 1260)		x			x				x	
Toxaphene		x			x				x	
Pentachlorophenol		x			x				x	
DDD		x			x				x	
DDE		x			x				x	
DDT		x			x				x	
Mirex		x			x				x	
Methoxychlor		x			x					

* See Table 1-4 for trip dates

** Organism collection attempts only; no mollusks (*Corbicula*) were recovered and no analyses were performed.

SECTION 2

METHODS

A detailed discussion of field sampling methods, equipment, shipping and storage methods, and analytical and biological procedures was prepared and submitted to the U.S. Army Corps of Engineers, Mobile District. The manual was prepared prior to the iniation of sampling to document all procedures. Table 2-1 summarizes that manual, tabulates and includes parameter abbreviations, Environmental Protection Agency (EPA) parameter STORET codes, analytical detection limits, units of measurement, methods of analysis, procedure reference, sample container and preservations and sample holding times. The parameters evaluated during this study are listed in the left column.

Quality assurance measures used throughout this study are based upon recommendations given in EPA's "Handbook for Analytical Quality Control in Water and Wastewater Laboratories," (1972) and recommendations from the Corps of Engineers Waterways Experiment Station. Data generation, transfer, and reporting procedures for this entire study are as follows: data collected in the field were logged into a bound field notebook; after field data are transferred to printed data sheets, the field notebook for that particular sampling period is put on file at Harmon Engineering & Testing; data generated in the laboratory are transferred from the bound bench notebook assigned to each technician to printed data sheets for report purposes; data are transferred to a STORET worksheet for computer card keypunch; and after keypunching, the data is entered into STORET by the COE.

2.1 PHYSICAL-CHEMICAL

2.1.1 Water

2.1.1.1 Sampling

As shown in Tables 1-5 and 1-6, a wide range of parameters were measured and analyzed during this study. In-situ measurements were performed at each main river station during each trip. Further in-situ measurements were made at the tributary and discharge stations. Water samples were collected at main river stations for physical-chemical analyses (see Table 1-6) and at tributary and discharge stations for turbidity. Further details of sampling procedures are given below.

Main River Stations

To correlate with physical-chemical data collection locations at main river stations R-1 through R-23, in-situ parameters (see Table 1-6) were measured using a Hydrolab 6000D "Surveyor." In-situ measurements were taken at midstream five feet below the water surface or at mid-depth where the river was less than ten feet deep. Further physical measurements made in-situ were transparency (Secchi depth) and light transmission. The latter measurement was used to determine the euphotic zone, defined as the water column above the depth of 99% light extinction.

TABLE 2-1. Analytical methods for physical-chemical and biological parameters, Middle Black Warrior and Tombigbee Rivers, July 1978 to October 1979.

PARAMETER	ABBREVIATION	EPA STORET CODE	REPORTING UNITS	DETECTION LIMITS	ANALYTICAL METHOD	REFERENCE	CONTAINER/ PRESERVATIVE	HOLDING TIME
I. WATER SAMPLING								
A. IN-SITU					Hydrolab Surveyor	1		
Temperature	None	0000010	C	0.1 C		2, p. 125	N/A	None
Dissolved Oxygen	D.O	0000299	mg/L	0.1 mg/L	" "	2, p. 450	"	"
pH	None	0000400	Standard Units	0.1 S.U.	" "	2, p. 460	"	"
Specific Conductance	Sp. Cond	0000094	mhos/cm	Not specified	"	2, p. 71	"	"
Oxidation Reduction Potential	ORP	0000090	millivolts	not specified	" "	1	"	"
Turbidity	None	0000076	Hach Formazin Turbidity Units	1 FTU	Nephelometric	2, p. 132	P/G, cool to 4°C	7 days
B. PHYSICAL-CHEMICAL								
Transparency	Trans. S.D.	0000073	meters	Not specified	Secchi disc	Note 2	N/A	None
% Light Transmission	L. Trans.	0000034	feet	1.0 inche	Photometer	11	"	
Residue, Total Nonfilterable	Res. Tot. Nor	0000530	mg/L	10 mg/L	Gravimetric	2, p. 94	P/G, cool to 4 C	7 days
Residue, Total Filterable	Res. Tot. Filt.	0070300	mg/L	10 mg/L	Gravimetric	2, p. 91	P/G, cool to 4 C	
Nitrogen, Nitrate-Nitrite	NO_3-NO_2	0000630	mg/L as N	0.01 mg/L	Cd reduction, colorimetric	3, p. 201	P/G, H_2SO_4 to pH 2, cool to 4° C	24 hours
Nitrogen, Ammonia	NH_3	0000610	mg/L as N	0.01 mg/L	Selective ion meter	3, p. 165	"	"
Nitrogen, Total Kjeldahl	TKN	0000625	mg/L as N	0.1 mg/L	Kjeldahl digestion, selective ion meter	3, p. 175	" "	7 days
Nitrogen, Total Organic (calculated)	TON	0000605	mg/L as N	0.1 mg/L	TON=TKN-NH_3	N/A	N/A	N/A
Nitrogen, Total Inorganic (calc.)	TIN	0000640	mg/L as N	0.1 mg/L	TIN=NO_3+NO_2+NH_3	"	"	
Nitrogen, Total (calc.)	N	0000600	mg/L	0.01 mg/L	N=TON+TIN	"	"	"
Phosphorus, Total	P	0000665	mg/L as P	0.01 mg/L	Persulfate digestion, colorimetric	2, p. 476	P/G, cool to 4°C	24 hours
Orthophosphate, Dissolved	Diss. o-P	0000671	mg/L as P	0.01 mg/L	Colorimetric	2, p. 481	Filter, P/G, cool to 4°C	"
Alkalinity, Total	Alk., Tot.	0000410	mg/L as $CaCO_3$	Not specified	titration, to pH 4.5	2, p. 278	P/G, cool to 4°C	
Free Carbon Dioxide (calculated)	CO_2	0000405	mg/L as CO_2	"	Calculation	2, p. 294	N/A	N/A
Color, True	None	0000080	Pt-C Units	" "	Visual comparison	2, p. 64	P/G, cool	24 hours
Carbon, Total Organic	TOC	0000680	mg/L as C	2.0 mg/L	Catalytic combustion, IR	3, p. 237	Glass, H_2SO_4 to pH<2, cool to 4°C	"
Carbon, Dissolved Organic	DOC	0000681	mg/L as C	2 mg/L	Filtration, catalytic combustion, IR	"	" "	"
Iron, Total	Fe	007401	µg/L	50 µg/L	Digestion, AAS	2, p. 143	P/G, HNO_3 to pH<2	6 months
Iron, Dissolved	Fe	0001046	µg/L	50 µg/L	Filtration, digestion, AAS	2, p. 143	" "	"
Manganese, Total	Mn	0001055	µg/L	50 µg/L	Digestion, AAS	"	" "	"
Manganese, Dissolved	Mn	0001056	µg/L	50 µg/L	Filtration, digestion, AAS	"	" "	"
Sulfate, Dissolved	SO_4	0000945	mg/L	1.0 mg/L	Turbidimetric	2, p. 496	Cool to 4 C	7 days
Sulfide, Total	S	0000745	mg/L	0.1 mg/L	Titrimetric, iodine	2, p. 505	Zn acetate & NaOH	24 hours
Calcium, Total	Ca	0000916	mg/L	0.1 mg/L	EDTA titration	2, p. 189	HNO_3 to pH<2	6 months
Zinc, Total	Zn	0001092	µg/L	10 µg/L	Digestion, AAS	2, p. 143	P/G, HNO_3 to pH<2	"
Magnesium, Total	Mg	0000927	mg/L	0.1 mg/L	" "	"	"	"
Hardness, (calculated)	None	0000900	mg/L as $CaCO_3$	Not specified	Calculation	2, p. 201	N/A	N/A
Sodium, Total	Na	0000929	mg/L	0.03 mg/L	Digestion, AAS	2, p. 143	P/G, HNO_3 to pH<2	6 months
Potassium, Total	K	0000937	mg/L	0.1 mg/L	" "	"	" "	"
Chloride	Cl	0000940	mg/L	1 mg/L	$AgNO_3$ titration	2, p. 303	P/G	7 days
C. BACTERIOLOGICAL								
Fecal Coliform	None	0031616	#/100 ml	Not specified	MF, M-FC @ 44.5°C	2, p. 937	Sterile glass, cool to 4°C	8 hours
Fecal Streptococci	"	0031673	#/100 ml	" "	MF, KF agar @ 35 C	2, p. 944	"	"
Coliform Streptococci Ratio (calculated)	F.C./F.S.	No code	None	Not Applicable	FC/100 ml : FS/100 ml	None	N/A	N/A

TABLE 2-1. Continued

PARAMETER	ABBREVIA-TION	EPA STORET CODE	REPORTING UNITS	DETECTION LIMITS	ANALYTICAL METHOD	REFERENCE	CONTAINER/ PRESERVATIVE	HOLDING TIME
II. SEDIMENT SAMPLING								
A. MECHANICAL grain size	None	0080159-0080214	% fines by wt.	N/A	Sieve/hydrometers, weigh	4	Plastic, cool to 4°C	N/A
B. PHYSICAL-CHEMICAL								
Volatile solids	None	0070325	Percent	Not specified	Ignition @ 550°C	2, p. 96	P/G, cool to 4°C	2 weeks
Carbon, Total Organic	TOC	0000687	g/kg as C	1 mg/kg	Combustion, gravimetric	2, p. 532	Glass, cool to 4°C	"
Nitrogen, Total Kjeldahl	TKN	0000627	mg/kg as N	0.05 mg/kg	Kjeldahl digestion, selective ion meter	3, p. 175	Plastic, cool to 4°C	7 days
Oil and Grease	None	0000557	mg/kg	5 mg/kg	Soxhlet extraction	3, p. 229	Glass, cool to 4°C	2 weeks
Phosphorus, Total	P	0000668	mg/kg	0.001 mg/kg	Persulfate digestion, colorimetric	3, p. 249	Plastic, cool to 4°C	14 days
C. HEAVY METALS								
Copper, Total	Cu	0001043	mg/kg	0.02 mg/kg	Digestion, AAS	3, p. 108	Glass, cool to 4°C	6 months
Iron, Total	Fe	0001170	mg/kg	0.005 mg/kg	" "	3, p. 110	" "	"
Lead, Total	Pb	0001052	mg/kg	0.05 mg/kg	" "	3, p. 112	" "	"
Manganese, Total	Mn	0001053	mg/kg	0.05 mg/kg	" "	3, p. 116	" "	"
Mercury, Total	Hg	0071921	mg/kg	0.2 µg/kg	" "	3, p. 118	" "	"
Cadium, Total	Cd	0001028	mg/kg	0.01 mg/kg	" "	3, p. 101	" "	"
Nickel, Total	Ni	0001068	mg/kg	0.05 mg/kg	" "	3, p. 141	" "	"
Arsenic, Total	As	0001003	mg/kg	0.002 mg/kg	" "	3, p. 95	" "	"
Chromium, Total	Cr	0001029	mg/kg	0.05 mg/kg	" "	3, p. 105	" "	"
Zinc, Total	Zn	0001093	mg/kg	0.01 mg/kg	" "	3, p. 155	" "	"
D. CHLORINATED HYDROCARBONS								
BHC, alpha	None	0039076	µg/kg	As low as practicable	Organic extraction, GC separation	7,8	Glass, cool to 4°C	7 days
BHC, gamma (Lindane)	"	0039343	"	" "	" "	" "	" "	"
BHC, beta	"	None	"	" "	" "	" "	" "	"
Heptachlor	"	0039413	"	" "	" "	" "	" "	"
Heptachlor epoxide	"	0039423	"	" "	" "	" "	" "	"
Aldrin	"	0039333	"	" "	" "	" "	" "	"
Pentachlorophenol	"	0039061	"	" "	" "	" "	" "	"
p,p' - DDE	"	0039321	"	" "	" "	" "	" "	"
Endrin	"	0039393	"	" "	" "	" "	" "	"
Endrin aldehyde	"	0034369	"	" "	" "	" "	" "	"
o,p' - DDD	"	0039311	"	" "	" "	" "	" "	"
p,p' - DDT	"	0039301	"	" "	" "	" "	" "	"
o,p' - DDT	"	0039307	"	" "	" "	" "	" "	"
Mirex	"	0039758	"	" "	" "	" "	" "	"
Methoxychlor	"	0039481	"	" "	" "	" "	" "	"
Chlordane	"	0039351	"	" "	" "	" "	" "	"
Toxaphene	"	0039403	"	" "	" "	" "	" "	"
PCB (AR 1242)	"	0039499	"	" "	" "	" "	" "	"
PCB (AR 1254)	"	0039507	"	" "	" "	" "	" "	"
PCB (AR 1260)	"	0039511	"	" "	" "	" "	" "	"
Dieldrin	"	0039383	"	" "	" "	" "	" "	"

TABLE 2-1. Continued

PARAMETER	ABBREVIATION	EPA STORET CODE	REPORTING UNITS	DETECTION LIMITS	ANALYTICAL METHOD	REFERENCE	CONTAINER/ PRESERVATIVE	HOLDING TIME
III. BIOLOGICAL SAMPLING								
Phytoplankton	None	Entered by Group	#/L	Not specified	Grab sample, Inverted microscope	2, p. 1012	5% buffered formalin	1 Year
Zooplankton	"	"	"	"	Net collection, count	2, p. 1016	" "	"
Macrophytes	"	No	Subjective area	" "	Direct observation	2, p. 1058	N/A	N/A
Macroinvertebrates PONAR dredge	"	Entered by Group	$\#/m^2$	" "	Microscopic Identification	2, p. 1060	10% buffered formalin	Indefinite
Multiple plate sampler	"	None	"	" "	Microscopic Identification	2, p. 1069	10% buffered formalin " "	"
Algal Growth Potential Test	AGP	None	N/A	N/A	EPA AAP:BT, nutrient limit	5	Cool to 4°C, dark	1 days
Adenosine triphosphate	ATP	0073396	ng/L	Not specified	Luciferin luminescence	2, p. 1035	Field extract, freeze	6 months
Chlorophyll a, b, c	None	Pigment species	"	" "	Spectrophotometric	2, p. 1029	Field filter, freeze	10 days
Benthic biomass	"	0000573	g, wet weight	0.1 mg	Blot-dry, weigh	See Text	10% buffered formalin	N/A
IV. MOLLUSK TISSUE								
A. HEAVY METALS								
Arsenic, Total	As	0001004	mg/kg	Lowest practicable	Digestion, AAS	3, 10	Glass, freeze	6 months
Cadmium, Total	Cd	0071940	"	" "	" "	"	" "	"
Chromium, Total	Cr	0071939	"	" "	" "	"	" "	"
Lead, Total	Pb	0071936	"	" "	" "	"	" "	"
Mercury, Total	Hg	0071930	mg/kg	" "	" "	"	" "	"
Selenium, Total	Se	0001149	mg/kg	" "	" "	"	" "	"
Zinc, Total	Zn	0071938	mg/kg	" "	" "	"	" "	"
B. CHLORINATED HYDROCARBONS								
Aldrin	None	0039334	ug/kg	Lowest practicable	Organic extraction, GC separation	6, 8, 9, 10	Glass, freeze	3 months
Dieldrin	"	0039381	"	" "	" "	"	" "	"
Chlordane	"	0039349	"	" "	" "	"	" "	"
Endosulfan sulfate	"	0034355	mg/kg	" "	" "	"	" "	"
Heptachlor	"	0039414	ug/kg	" "	" "	"	" "	"
BHC, alpha	"	0039074	"	" "	" "	"	" "	"
BHC, gamma (Lindane)	"	0039075	"	" "	" "	"	" "	"
BHC, beta	"	None	"	" "	" "	"	" "	"
PCB (AR 1242)	"	0039497	"	" "	" "	"	" "	"
PCB AR 1254	"	0039512	"	" "	" "	"	" "	"
PCB AR 1260	"	None	"	" "	" "	"	" "	"
Toxaphene	"	0039407	"	" "	" "	"	" "	"
Pentachlorophenol	"	0039060	mg/kg	" "	" "	"	" "	"
Heptachlor epoxide	"	0039424	ug/kg	" "	" "	"	" "	"
p,p'-DDD	"	0039314	"	" "	" "	"	" "	"
p,p'-DDE	"	0039324	"	" "	" "	"	" "	"
p,p'-DDT	"	0039317	"	" "	" "	"	" "	"
o,p'-DDT	"	0039318	"	" "	" "	"	" "	"
Mirex	"	None	"	" "	" "	"	" "	"
Methoxychlor	"	0039482	"	" "	" "	"	" "	"

TABLE 2-1. Continued

General Notes:

1. The analytical methods employed during this study have been briefly shown on this table. The abbreviation refers to data sheets in the Appendices. The detection limits are those set by the Corps. The "Analytical Method" is a synopsis; the reference refers to source and page or method number.

2. Welch, 1948.

3. "Container/Preservative" codes:

   P indicates a plastic container
   G indicates glass only
   P/G indicates either type may be used

4. Holding times are those recommended by the Corps or EPA in Reference 3 below.

5. N/A = Not applicable

References:

1. Hydrolab Operators Manual. 1978.

2. Standard Methods for the Examination of Waters and Wastewaters, 14th Edition, 1976.

3. Methods for Chemical Analysis of Water and Waste, EPA 625/6-74-003, 1974.

4. "Ecological Evaluation of Proposed Discharge of Dredge or Fill Material into Navigable Water," Dredged Material Program Miscellaneous Paper D-76-17, U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, May, 1976.

5. U. S. Environmental Protection Agency. 1978. The *Selenastrum Capricornutum* Printz Algal Assay Bottle Test. Corvallis, Oregon.

6. "Analysis of Pesticide Residues in Human and Environmental Samples," Health Effects Research Laboratory, U. S. Environmental Protection Agency, Research Triangle Park, North Carolina, December, 1976.

7. "Method for Organochlorine Pesticides in Industrial Effluents," U. S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, 43268, 1973a.

8. "Method for Polychlorinated Biphenyls (PCB's) in Industrial Effluents," U. S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, 43268, 1973b.

9. "Methods Which Detect Multiple Residues," HEW/FDA Pesticide Analytical Manual, Vol. 1, FDA Office of Associate Commission for Compliance, Rockville, Maryland.

10. "Sampling and Analysis Procedures for Screening of Fish for Priority Pollutants," U. S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio, August, 1977.

11. Operator's Manual for Montedoro-Whitney transmissometer.

Water samples were collected at main river stations for laboratory analysis of the physical-chemical parameters listed in Table 1-6. Samples were collected five feet below the water surface or at mid-depth where the river was less than ten feet deep. A one-liter acrylic horizontal water sampler was used to collect the water from the desired depth.

In addition to the above data collection, in-situ measurements (via the Hydrolab) were taken to define any vertical physical-chemical stratification at the mid-stream point. Each month, beginning with Trip 3, a comparison was made between in-situ measurements at one foot below the surface and at three feet above the river bottom. If the field personnel observed an apparently significant variation in any of the in-situ parameters, an additional water sample for physical-chemical analysis was then drawn from three feet above the river bottom using a vacuum pump. (To preserve any anaerobic qualities, the sample was drawn into a nitrogen purged flask and was then carefully poured into a sample bottle and tightly capped.) When no apparently significant vertical stratification was observed, the lower depth was measured only for in-situ parameters.

Further observations on mixing and stratification were made three times during the study: October 1978, February 1979 and August 1979. During these months, in-situ parameters were measured at the one foot and near-bottom depths at three points along a horizontal transect. These points were chosen to include the littoral zone of each shore and the deepest point of the main river channel.

Cross Section Stations

At stations R-8 and R-22 the in-situ parameters were measured in a vertical profile at three or four points across the width of stream. This profile was either a top and bottom comparison or, if the comparison showed apparently significant stratification, the profile was completed to be a continuous record.

Below a Lock

Station R-11, located in the tailrace of Warrior Lock, was monitored for in-situ parameters before and after operation (dewatering) of the lock. These measurements were made at five feet or at mid-depth if the depth was less than ten feet. Additionally, a 125 ml sample was collected at the same depth before and after dewatering and analyzed in the laboratory for turbidity.

Tributary and Discharge Stations

Tributary stations T-1 through T-11 and Discharge stations D-1 through D-6 were also measured for in-situ (Hydrolab) parameters and turbidity at five feet or mid-depth where the depth was less than ten (10) feet. Measurements and samples were taken in the mouths of tributaries, as far upstream as necessary to eliminate the major influences of the river proper. Discharge samples were taken at the point where the discharge entered the river or the nearest accessible and affected point below the discharge.

2.1.1.2 Analyses

Analytical methodology for physical-chemical parameters are presented in Table 2-1. During the course of this study, it was

necessary to alter some of the procedures as they were specified in the contract at the initiation of the project. The changes, as a whole, are minor and are tabulated in Table 2-2. Slight method adjustments were made (sample volumes, pretreatment for interferences, etc.) in the analytical laboratory with increasing familiarity with the sample types. Where these adjustments were included in the analytical methodology as an adjunct to published methods, they do not appear in Table 2-2.

2.1.1.3 Quality Control

Laboratory analyses were monitored using a system of duplicate sample analyses, spiked sample analyses and analyses of "blind" check samples. The duplicate and spiked analyses were statistically evaluated for precision and accuracy by the Shewhart method (U.S. EPA, 1979).

Each duplicate and spiked analysis was performed by two methods -- field splits and spikes and laboratory splits and spikes. One sample was duplicated for each sampling day. Field duplicates were obtained by splitting the grab sample into two containers which were plainly labeled. Each field duplicate sample was analyzed for each required parameter and the results were averaged for reporting. 50% of the duplicate samples for heavy metals analyses were spiked with known quantities of metals. Laboratory duplicates were performed at random by the analyst for various parameters. These extra duplicate analyses served as an independent check of the method and the analyst. Laboratory spiked samples were routinely analyzed by the known addition method for each applicable parameter (see Appendix B for the parameters analyzed in this program).

Shewhart precision and accuracy charts were used to evaluate the validity of results obtained as described in EPA's "Handbook for Analytical Quality Control in Water and Wastewater Laboratories," (1972). These charts were maintained using results of duplicate and spike analyses. The quality control data was routinely consulted and checked by the analyst and the quality control co-ordinator. If any results were judged to be "out of control" according to the Shewhart charts, the analyses were repeated. If repetition was not possible, the results were not reported.

Calibration curves were calculated using a least-squares linear, regression to calculate the best-fit line for standards. Standards were prepared daily and run with each set of analyses.

2.1.2 Sediment

2.1.2.1 Sampling

Sediment samples for physical-chemical analysis were collected at each main river station twice during the study (Table 1-6). An epoxy-coated 9" x 9" Ponar dredge was used to collect one sediment sample from each of four equally spaced points across the river. This transect began and ended near each bank. The four samples were composited by mixing them in a large glass-lined box. After thorough mixing by stirring, aliquots for analysis were taken from the composite. The aliquots were preserved and stored according to methods given in Table 2-1.

Table 2-2. Procedural changes in physical-chemical methods for Middle Black Warrior and Tombigbee Rivers, July 1978 through October 1979.

PARAMETER / METHODOLOGY	CARBON, DISSOLVED ORGANIC	COLOR, TRUE	TURBIDITY
METHOD ALTERED	Catalytic combustion, infrared analysis; EPA 1976, p. 237.	Visual comparison; Standard Methods 14th Ed., p. 64.	Field Turbidimeter
METHOD REQUIREMENT	Filter sample on-site.	Centrifuge sample prior to color determination to remove turbidity.	Determine turbidity in the field (in situ).
METHOD ALTERATION	Filter sample immediately prior to analysis.	Do not routinely centrifuge sample.	Determine turbidity in the laboratory within 24 hours of sample collection.
REASON	Field-filtered samples showed consistently higher levels of DOC than TOC. Samples filtered in the lab immediately prior to analysis did not.	Turbidity of samples normally very low and non-interfering.	Turbidity determination in situ impractical and not necessary for accurate and precise results.

2.1.2.2 Analysis

Methods of sediment analysis for heavy metals and chlorinated hydrocarbons are given in Table 2-1. Final extract analysis for chlorinated hydrocarbons was made using a Varian gas chromatograph equipped with an electron capture detector.

The analytical procedure for oil and grease in sediment was initially a separatory funnel extraction utilizing Freon, with a gravimetric determination of the oil and grease thus extracted. This method proved to be impractical, due to formation of an extremely heavy emulsion, in which the two phases (sediment and Freon) were indistinguishable.

The alternative method, which was used for all sediment samples, involved a Soxhlet extraction using Freon in a continuous four-hour extraction process. This method also employs a gravimetric finish to determine the quantity of oil and grease extracted into the Freon. This method is a standard method frequently used for extraction of hydrocarbons from solid materials. Oil and grease recovery was obtained with a wet sample weight of 50 grams.

2.1.2.3 Quality Control

Duplicate and spiked duplicate sediment samples were analyzed for heavy metals, chlorinated hydrocarbons and for the physical-chemical parameters listed in Table 2-1. Duplicate samples were prepared in the laboratory by withdrawing two aliquots from the well-mixed composite samples. One station was duplicated each sampling day.

Sediment samples were spiked in the laboratory for each applicable parameter for each sampling day. To spike these samples, the known addition solution was added to an aliquot prior to ultrasonic treatment. The ultrasonic vibrations caused a thorough mixing. The intent was to expose the spike to the sample and check for loss into media.

The results of duplicate and spike analyses were subjected to the Shewhart procedure as given in Section 2.1.1.

2.1.3 Mollusk

2.1.3.1 Sampling

Numerous attempts were made to collect *Corbicula* of an age sufficient to analyze ($\geq$ 2 years). No collection effort yielded enough *Corbicula* at any given location to justify analysis and this segment was eliminated from the study.

2.2 BIOLOGICAL

2.2.1 Bacteriological

Bacteriological analyses were conducted at main river stations and at specified bacteriological stations (Tables 1-5 and 1-6 and Figures 1-2 and 1-3) during the June through September sampling periods.

These analyses consisted of surface water collections, membrane filtration, incubation and counting for total fecal coliform bacteria and total fecal streptococcus bacteria performed as described below. A ratio of fecal coliform to fecal streptococci was calculated for each station. All equipment used to handle and prepare samples was sterilized by autoclaving at 15 psi for 20 minutes prior to each sampling trip and maintained in closed containers, and sterile foil wrappers.

2.2.1.1 Sample Collection and Preparation

Bacteriological water samples were collected by submersing a presterilized, plastic, two-quart milk container to the depth of one foot and allowing it to fill to approximately one liter. Four aliquots (two 10 ml and two 100 ml) were immediately vacuum filtered through sterile Millipore 0.45 μm gridded membrane filter pads. Each pad was then washed in three-20 ml portions of sterile, distilled water. Occasionally, due to siltation or expected high bacteria posulations, 5 and 50 ml aliquots were filtered. After each filtration, the filter pad was placed on the appropriate media in prepared plastic petri plates. These plates were then held in ice chests at approximately 4°C for no longer than eight (8) hours before incubation began.

2.2.1.2 Media and Incubation

Total fecal coliforms were cultured on M-FC broth with 1:100 percent rosalic acid added (APHA, 1975). Fecal streptococci were cultured on KF streptococcus agar absorbed onto 48 mm diameter sterile filter paper pads (APHA, 1975).

Both types of samples were incubated in Millipore-brand aluminum block heat-sink type portable incubators capable of holding temperatures to $\pm$ 0.2°C. Fecal coliforms were incubated at 44.5°C $\pm$ 0.2°C for twenty-four (24) hours and fecal streptococci were incubated at 35°C $\pm$ 0.2°C for forty-eight (48) hours.

2.2.1.3 Counting and Calculations

After the appropriate incubation time, the plates were removed, visually inspected and the colonies counted. Fecal coliforms were defined on the M-FC rosalic acid media as blue greenish metallic appearing colonies. The fecal streptococci colonies cultured on the KF agar were reddish pink. All the observable colonies on each plate were counted and recorded. The number of colonies per 100 ml was then calculated for each bacterial type by taking the count form the pad that was within the proper range, as given in Standard Methods, 14th edition (page 943).

2.2.1.4 Quality Control

The bacteriological analysis was quality control (QC) monitored by the routine use of duplicates for at least 10% of the inoculations. Duplication involved splitting a water sample and performing two (2) separate analyses. The results of the two (2) acceptable duplicate samples were averaged for the reported result. An acceptable duplicate

was taken to be < 10% variation between the counted colonies. If this level of variation had ever been exceeded, and if physical differences in the plates (e.g. filter pad not contacting media in one plate) could not be seen, the results for the station would have been discarded.

2.2.2 Phytoplankton

2.2.2.1 Collection and Preservation

The collection of phytoplankton samples for identification and enumeration was performed at each main river station (Table 1-1 and Figures 1-2 and 1-3) during each sampling trip. A composite sample was prepared by mixing one liter grabs obtained with a PVC alpha-type horizontal sampler at one meter intervals throughout the euphotic zone (Table 2-1). The depth of the euphotic zone was determined by measurement of the 1% light transmission depth with a submersible Montedero-Whitney photometer (see Section 2.1.1). A one liter aliquot of the well-mixed composite was then poured into a two quart jug and enough sodium tetraborate neutralized formaldehyde added to produce a 5% formalin preservation.

2.2.2.2 Counting and Calculations

Upon return to the laboratory, the samples were counted by the inverted microscope procedure of Utermohl (1958), with the exception of counting duration. Each sample was mixed by gentle inversion of the container at least 40 times and an aliquot poured into 50 ml combination tube-base plate settling chambers using an Utermohl cup. The actual size of the aliquot used varied due to siltation or algal density in the sample, but was normally 10, 25 or 50 ml.

An ideal sample was considered to have non-clumped, random distribution with the settled material only one layer (5-10m) thick. Early in the study, the ability of the equipment to produce random distribution was checked statistically using the chi-square method (Lund, et. al., 1958) and was found to be reliable (25 counts in 5 sets of 5 counts tested, Poisson's Law, p=0.05). Thus, according to the authors, a single count is sufficient to produce reliable estimates of phytoplankton numbers. Thus, after pouring, each tube was allowed to settle at least eighteen (18) hours and then used for algal identification and enumeration.

Phytoplankton counts were made using a Wild-Heerburg M40 inverted biological microscope equipped with 4X, 10X, 43X and 100X planachromatic Floutar objectives and 10X wide field compensating eye-pieces fitted with a European style 12x12 grid (41,616 μm^2 at 430X). The settling chambers were examined in horizontal strips along randomly spaced vertical axes at 430X. The identification and enumeration of phytoplankton along these strips was continued until 300 plants had been observed. For colonial, coenobic or filamentous forms, cell counts (or estimates) were made for each plant. Algae were consistently identified to genus and routine identification to species was made where feasible. The two dominant algae (by cell density) were always identified or ralated to species. Characterless or otherwise unidentifiable volvocine and coccoid green algae were lumped together as "unknown

chlorophytes"; obscured, minute or otherwise unidentifiable Pennales were lumped together as "other pennate diatoms".

Calculation of the reporting value was made by the following formula:

$$\text{cells/liter} = N \times \frac{TA}{AE} \times \frac{1000}{AV}$$

where:

N = number of cells observed while counting
TA = total area of cahmber (500 mm^2)
AE = area examined (mm^2)
AV = aliquot volume (ml)

The summarized values for major divisions and classes were then entered on the EPA STORET system.

References used for identification of phytoplankton were Cocke (1967), Drouet and Daily (1956), Drouet (1968, 1973, and 1978), Patrick and Reimer (1966 and 1975), Prescott (1978), Prescott, Croasdale and Vinyard (1972, 1975, and 1977), Smith (1920, 1921 and 1950), Vinyard (1974), Weber (1966) and Whitford and Schumacher (1973).

2.2.2.3 Quality Control

Phytoplankton identifications and enumerations wer QC monitored by two (2) methods. Split sample aliquots were sent to the COE for outside expert verification. In-house split sample aliquots were occasionally analyzed to determine consistency of the sample handling and analysis procedures. When a new phycologist was added (may 1979), all aspects of the procedure including sample preparation, identific-ations, counting method and calculations were compared on a one-to-one duplication basis until uniform results were achieved.

2.2.3 Zooplankton

2.2.3.1 Collection and Preservation

Collections for zooplankton identification and enumeration were made during each sampling period (Table 1-1) at each main river station (Table 1-1 and Figures 1-2 and 1-3). Sampling procedures used a metered net and laboratory analysis was accomplished by direct microscopical examination of the zooplankton.

Field collections for zooplankton were made using a 0.5 m dia-meter, 80 μm mesh Wisconsin style net. A flow meter was suspended at the upper collar of this net and was held in place while lowering the net by a device designed after that of Dycus and Wade (1977). The net was closed, lowered to within 8 to 10 feet of the bottom and the meter released by a messenger weight. The net was then vertically towed to the surface at a rate no greater than 1 m/sec. The final meter reading was recorded for calculation of the volume of water passed through the net. (This calculation was based on meter readings obtained by towing the net from known depths and thus known volumes in a swimming pool. The net-meter system was calibrated several times

during the study to correct occluding of the mesh openings). The outside of the net was then rinsed to wash all organisms into the collecting bucket from which they were transferred to a plastic 250 ml sample bottle. A few drops of borax buffered formaldehyde was added to produce a 5% formalin solution.

Occasionally, net clogging due to silt or abundance of organisms was encountered. At these times, the net was towed to the estimated point at which clogging would begin, closed, pulled to the surface and rinsed as described above. The meter reading was recorded, the net reclosed, relowered to the ending depth from the previous tow, triggered and the steps repeated until the column had been sampled.

2.2.3.2 Counting and Calculation

Upon return to the laboratory, samples were well-mixed by gentle inversion and poured into a graduated cylinder. A one ml aliquot was removed with a Henson-Stempel pipet and carefully injected into a Sedgwick-Rafter counting cell. This aliquot was allowed to settle for a few minutes. Counting was done on a Baush-Lomb compound microscope equipped with 4X, 10X and 20X objectives and 10X widefield eyepieces. Horizontal strip counts were used, beginning in the upper left corner and proceeding until 300 organisms were encountered. If this many animals had not been observed in the examination of five (5) entire counting chambers, the procedure was stopped. Identification of organisms was routinely made to genera and specific epithets were provided for the two dominant genera.

Reporting values were calculated by the following formula:

$$\text{organisms/liter} = \frac{\frac{SV}{VE}}{TV} \times N$$

where:

N = number of organisms counted in chamber
SV = sample volume measured in cylinder (ml)
VE = volume examined in chamber (ml)
TV = total volume passed through the net (l)

This number was reported as calculated, unless <0.05, in which case it was normally reported as <1. Group summaries for each month were entered in the EPA STORET system.

References used for the identification of zooplankton organisms were Eddy and Hodson (1961), Edmondson (1959), Jahn (1949), Kudo (1946) and Pennak (1953, 1978).

2.2.3.3 Quality Control

Zooplankton identifications and enumerations were QC monitored in tow (2) ways. Split sample aliquots were sent to the COE for verification. In-house split sample aliquots were occasionally analyzed to determine consistency of the sample handling and analysis procedures. When a new biologist was added for zooplankton analysis (May 1979) all procedures, including sample preparation, identifications, counting method and calculations were compared on a one-to-one basis until uniform results were achieved.

2.2.4 Macroinvertebrates

Macroinvertebrates were collected at selected stations during each sampling period by either Ponar dredge or multiple plate sampling (Table 1-5). The collection and preservation methods for the two types of samplers are given below, followed by a generalized discussion of counting and calculation.

2.2.4.1 Collection and Preservation

Ponar

Benthic macroinvertebrate samples were collected by the use of a 9" x 9" weighted Ponar dredge. Three different dredges were used during this study, each with slightly different dimensions, thus providing varying areal multipliers. A single dredge sample was pulled from near the right and left banks and at midstream of each station. These were individually field washed through U.S. Standard No. 30 mesh screens and preserved with enough formalin to produce a final 10 percent concentration. The samples were stored in labeled plastic containers for transport.

A final washing was made in the laboratory by using a concentrated saline flotation (Weber, 1973) to remove the invertebrates and detritus from the bulk sediment. This material was represerved in rose bengal stained 10 percent formalin solution until counted.

Multiple Plate Samplers

The multiple plates used during this study were the modified Hester-Dendy "Jumbo" type described by Weber (1973) cut from 1/4" thick double tempered Masonite. The final total area of the sampler was 0.14 m^2. The samplers were generally suspended to a depth of four feet from buoys (except Station 4 where tree branches were used) by the use of nylon rope or steel aircraft cable.

After a six week exposure period, the multiple plate samplers were retrieved by gently raising the sampler to the surface, lowering a No. 30 mesh bucket under it and then lifting the plates out of the water. The sampler and any invertebrates in the mesh-bottomed bucket were placed on ice and transported to the laboratory where they were further processed within 24 hours.

Final processing involved disassembling the sampler and gently scraping the attached invertebrates onto a No. 30 mesh screen. The samples were washed clean of all possible detritus and rinsed into plastic containers with enough rose bengal stained formalin to make a 10 percent preservation.

2.2.4.2 Counting

For both dredge and multiple plate samplers, the procedures for counting were identical. The samples from the final storage containers were rinsed free of formalin, placed in white enamel trays and the organisms separated from the detritus. A 2X illuminated magnifier or 7X magnification with a dissecting microscope was used to aid sorting. The sorted organisms from dredge samples were placed in

water and held at 4^oC until weighed. The samples collected by the multiple plate method were not weighed.

Taxonomic separation and enumeration was performed using a Nikon 0.8X - 4X dissecting microscope and 10X eyepieces. Diopters and 15X eyepieces gave the possibility of up to 120X total magnification for aid in identification. Organisms were usually identified to genera unless monospecific or otherwise easily identifiable to species. Nematodes were identified only to class and Oligochaeta to family. Chironomids were mounted in Hoyer's mounting medium and identified with the compound microscope. Other unwieldy classes were taken to the lowest toxan practicable.

References used in laboratory identification were Beck (1976), Brinkhurst (1971), Brown (1976), Ferris, Ferris and Tjepkema (1973), Mason (1973), Merritt and Cummins (1978), Needham and Westfall (1954), Parrish (1975), Roback (1976, 1977, 1978), Usinger (1956) and Edmundson (1959)

2.2.4.3 Biomass

The organisms from the dredge samples were blotted dry and weighed to the nearest 0.1 mg. *Corbicula* greater than 0.5 cm valvar height in these samples were not all weighed, but rather an average wet weight of the meat was applied by 0.5 cm diameter classes. The average weights for these classes were 0.5 - 1.0 cm, 4.1 mg; 1.0 - 1.5 cm, 95 mg; 1.5 - 2.0 cm (none collected), 2.0 - 2.5 cm, 557 mg; 2.5 - 3.0 cm, 1.3 g; 3.0 - 3.5 cm, 2.2 g; 2.5 - 4.0 cm, 2.7 g; 4.0 - 4.5 cm, 3.4 g; 4.5 - 5.0 cm and 5.1 g.

2.2.4.4 Calculations and Indices

For each Ponar and multiple plate sample, the number of organisms per square meter was calculated by simply applying the appropriate multiplier to produce the number on a total square meter. For example, the multiple plate samples were 0.14 m^2, the multipler is 7.1. As previously stated, three different Ponar dredges were used, but the individual multipliers were obtained in the same manner.

Data evaluation for Ponar samples included the calculation of a diversity index for each station. The machine formula of Lloyd, Zar and Karr (1968) was used to provide the Shannon-Weaver diversity ($\bar{d}$) measured as follows:

$$d = C/N\ (N \log_{10} N - \Sigma n_i \log_{10} n_i)$$

where:

C = 3.321928
N = total number of individuals
n_i = total number of individuals in the i^{th} taxa

Evenness, an index of distribution of the numbers among the species, was calculated by the following formula (Weber, 1973):

$$\frac{\bar{d}}{\ln N}$$

These two indices were calculated from totals for each station, i.e., summations of taxa and numbers from right bank, mid-channel and left bank.

The summary data from Ponar collections was entered into the EPA STORET system.

2.2.4.5 Quality Control

Macroinvertebrate identifications and enumerations were QC monitored by a system of cross-checks and repeat counts among the participating biologists, within each set of samples a few would be recounted and identifications compared for agreement. Disagreement was resolved and a further sample checked with agreement was reached. The separation step was monitored by checking the material remaining after each flotation for obvious organisms. To insure the validity of the taxonomy used, representative organisms were sent to the COE.

2.2.5 Aquatic Macrophytes

Macrophytic vegetation includes nonvascular and vascular plants associated with the impoundment substrate or shoreline. General categories for macrophytes include those plants that are free-floating or are attached by roots and are either completely underwater (submerged) or partially above water (emergent).

Observations of macrophytes were performed during two trips (Table 1-6). The primary method of detection was by direct examination of shorelines, embayments, creeks and sloughs and the shallower areas of the reservoir proper. The investigator made field notes and collections indicating species, areas of growth and location. For various species, a permanent botanical record was made by herbarium-type mounting of plants.

Reporting was done by compilations of species lists for the reservoir, distribution and abundance maps giving locations and approximate areal extent for the dominant plants.

References used for identificaion of the plants seen and collected were Radford, Ahles and Bell (1968) and Small (1933).

2.2.6 Other Parameters

2.2.6.1 Algal Growth Potential (AGP) Test

Sampling

Water samples were collected for AGP tests from selected main river stations (see Table 1-5) during three sampling trips (see Table 1-6). The sample was obtained by compositing individual grabs taken at one meter intervals throughout the euphotic zone (see Section 2.1.1). Several liters of the well-mixed composite were transferred to autoclavable Nalgene bottles and transported on ice in sealed ice chests.

Analysis

Upon receipt at the laboratory, a portion of each iced sample was removed and set aside for chemical analyses. The remainder was autoclaved at 15 psi and 121°C for 30 minutes. After autoclaving, the sample was filtered using sterile techniques. The filtered water was aerated with sterile (0.45 μm filtered) air to restore lost CO_2 balance. Chemical analyses were performed on the previously set aside sample and the autoclaved, aerated sample for the following parameters: total Kjeldahl nitrogen, nitrate and nitrite, ammonia, total phosphorus, dissolved orthophospate, conductivity and pH using the procedures described in Section 2.1.1. The water remaining from the autoclave treatment was used for AGP test.

AGP Test Procedure

Methodologies used for setting up and performing the AGP test were taken from the USEPA publications Algal Assay Procedures: Bottle Test (1971) and The *Selenastrum capricornutum* Printz Algal Assay Bottle Test (1978) and was primarily designed after procedures in the 1971 report. These documents should be consulted for amplification of details of this procedure such as glassware preparation.

Each of the water samples for each station was used to prepare eight test flasks in triplicate, which received the following nutrient "spikes":

In 25 ml of sample water, in a 125 ml Erlenmeyer flask,

Test I - Lake water sample
Test II - Lake water sample + 0.05 mg P/l as K_2PO_4
Test III - Lake water + 1.00 mg N/l as $NaNO_3$
Test IV - Lake water + 0.05 mg P/l + 1.00 mg N/l
Test V - Lake water + 1.00 mg Na_2EDTA/l
Test VI - Lake water + 0.05 mg P/l + 1.00 mg Na_2EDTA/l
Test VII - Lake water + 1.00 mg P/l + 1.00 mg Na_2EDTA/l
Test VIII - Lake water + 0.05 mg P/l + 1.00 mg N/l + 1.00 mg Na_2EDTA/l

The nutrient spikes were introduced by 0.25 ml injections of appropriately concentrated stock media to the 25 ml of sample water, thereby providing negligible volumetric difference between the flasks.

Into each of the flasks an inoculum of approximately 5,000 cells of the test alga (*Selenastrum capricornutum* Printz) was introduced by sterile pipets. The alga was obtained from a laboratory stock culture maintained from original material provided by the Corvallis office, USEPA. The inoculate culture was fourteen days old when it was inoculated into the test flasks.

The flasks were placed onto a shaker table, prepared according to USEPA (1978), in a 10' x 10' controlled environment chamber. The shaker table was agitated approximately 85 oscillations per minute; the temperature was 75°F ± 2°F. Illumination was provided by a bank of cool white flourescent lights positioned to provide 4,400 lumens at the table surface. The flasks were left at these conditions for 12 days when a 5 ml sample was drawn off for standing crop estimation;

at 14 days the test was halted, and the entire sample was preserved with the addition of enough formalin to make a 5 percent preservative solution. These preserved samples were used for final 14 day standing crop estimation.

Standing Crop Estimation

A standard Neubauer hemacytometer was used to estimate the number of algal cells produced per milliliter of the culture media. A 0.1 ml drop was placed on each grid of the hemacytometer with a blood pipet and a total of 200 of the smallest squares were counted on each. If the two counts did not agree to within 10 percent, a third was counted and the disagreeing count rejected.

The hemacytometer count was converted to cells/milliliter by the following formula (adapted from Hauser Scientific, 1974):

$$\text{cells/ml} = \frac{N \times DF \times CF}{A}$$

where:

N = number of cells counted
DF = dilution factor (DF = 1, no dilution)
CF = correction factor for volumes (CF = 4×10^6
A = number of squares counted (4×10^2)

After one test, an attempt was made to correlate cell numbers to weight using the 0.45 μm membrane filter technique (USEPA, 1971). This procedure was abandoned after this single trial due to non-reproducible results.

Chlorophyll *a*, *b* and *c*

Chlorophyll samples were collected at main river stations during each sampling period (see Figures 1-2 and 1-3 and Table 1-1). The samples were obtained by compositing individual grabs taken at one meter intervals throughout the euphotic zone (see Section 2.1.1). Triplicate aliquots of 300 - 1,000 ml were withdrawn from the well-mixed composite and filtered through glass fiber filter pads at approximately one-half atmosphere (8 psi). The filter pads were placed in individually labeled plastic bags and stored on ice and, upon return to the laboratory, were stored at -4°C until analyzed.

Chlorophyll was extracted and analyzed by the spectrophotometric method as detailed in the 14th edition of Standard Methods (APHA, 1975). Concentrations of the pigments were determined by the trichromatic equations and pheophytin corrected chlorophyll *a* values (APHA, 1975).

Adenosine Triphosophate (ATP)

Samples for ATP analysis were collected at each main river station during each sampling period (see Figures 1-2 and 1-3 and Table 1-1). The samples were obtained by compositing individual grabs taken at one meter throughout the euphotic zone (see Section

2.1.1). Triplicate aliquots were filtered through glass fiber filter pads at approximately one-half atmosphere (8 psi). The ATP was extracted in the field and the extract frozen until analyzed.

Analytical methodology followed that of ASTM method 01-031077-16 (ASTM, 1978).

Qualisy Control for Chlorophyll and Adenosine Triphosphate analyses

These quantitative indicator analyses were not performed using Shewhart QC methods. Rather, triplicate analyses were performed in each case and the results averaged to give the final answer. This arrangement was satisfactory in that it aided in and eliminated the variability inherent in the collection of biological samples. Additionally, ATP analyses were monitored by spiking samples with known concentrations of ATP and checking instrument response. Chlorophyll *a* was checked using EPA-supplied knowns. All independent checks produced answers indicating reliable analyses.

SECTION 3

RESULTS

3.1 PHYSICAL-CHEMICAL

The results of physical-chemical measurements and analyses are presented in summarized form in this section. Tabulations of all raw data can be found in the Appendices.

The summaries presented in this section have been subdivided in two ways. The parameters have been grouped by related categories, i.e., in-situ measurements, major ions and related parameters, nutrients, heavy metals and microbiological parameters. These parameter groups have then been tabulated by river sections as presented in Section 1.0 of this report (see Tables 1-1, 1-2, 1-3 and Figures 1-2, 1-3). These two subdivisions allow for an assessment of the means and ranges of the parameters between sections of the study area with markedly different concentrations and trends of many investigated parameters.

To adequately distinguish the variation in water quality between the river basins, a further subdivision has been added to the segments given in Section 1. This secondary segmentation considers the Black Warrior River above Warrior Lock and Dam (Stations R-1 through R-9, hereinafter referred to as Warrior Lake) and below Warrior Lock and Dam (Stations R-10 through R-16, hereinafter referred to as the Lower Black Warrior River). The remaining stream segments are the Tombigbee River (R-17 through R-21) and Demopolis Lake (R-22 through R-23). The tributary (T) and discharge (D) stations are included in the appropriate river reach for the tabulation of in-situ parameters. These four river section designations will be utilized for results presented in Section 3.1.

3.1.1 Water

All physical-chemical and associated water quality parameters investigated during this study are summarized in this section. The following tables present the means and ranges for the parameters. The individual means were calculated from the total number of concentrations for a station from all sampling trips. Grand means for the river section are given at the right-hand side of each table.

3.1.1.1 In-Situ and Associated Parameters

Main River Stations

Tables 3-1 through 3-4 show the means and ranges for in-situ and associated parameters for all main river stations. The tributary and discharge stations are included in downstream order to indicate any water quality changes contributed by these sources, but do not figure in the grand mean.

Water Temperature. Mean water temperatures were approximately 23-24^{o}C for all river stations. The lowest mean temperature was 26.1^{o}C at station R-16 (Table 3-2). The lowest monthly water

TABLE 3-1. Means and Ranges of In-Situ and Associated Parameters Measured at Main River, Tributary and Discharge Stations, Middle Black Warrior River Stations R-1 thru R-9, (Warrior Lake) July, 1978 thru October 1979.

PARAMETER	R - 1	R - 2	D - 1	R - 3	R - 4	T - 1	T - 2	T - 3	R - 5	T - 4
Temperature °C	22.3 (10.0 - 29.0)	22.4 (10.0 - 29.5)	23.6 (11.0 - 30.5)	23.2 (11.0 - 30.0)	23.3 (10.0 - 30.0)	22.1 (7.5 - 29.0)	20.7 (6.5 - 27.5)	21.6 (6.5 - 28.5)	23.4 (10.5 - 29.5)	21.0 (8.5 - 27.5)
Depth 1% Light Remains (feet)	9.0 (2.0 - 15.0)	8.1 (2.0 - 13.0)	not measured	7.3 (1.1 - 14.0)	6.3 (1.2 - 10.0)	not measured	not measured	not measured	5.8 (1.2 - 10.0)	not measured
Turbidity Hach FTU	8 (3 - 18)	9 (3 - 18)	15 (6 - 34)	13 (3 - 33)	14 (4 - 32)	20 (9 - 40)	27 (2 - 110)	20 (5 - 46)	18 (5 - 61)	16 (10 - 23)
Transparency Secchi Disc (meters)	1.1 (0.5 - 2.2)	1.1 (0.5 - 1.8)	not measured	0.8 (0.4 - 1.5)	0.7 (0.4 - 1.2)	not measured	not measured	not measured	0.6 (0.4 - 1.1)	not measured
ORP mV	400 (310 - 480)	390 (315 - 460)	380 (305 - 460)	390 (325 - 460)	390 (320 - 460)	371 (270 - 450)	362 (200 - 450)	376 (290 - 460)	390 (285 - 470)	387 (90 - 490)
Specific Conductance μmhos/cm @25 C	185 (155 - 210)	185 (155 - 210)	430 (140 - 1100)	185 (135 - 205)	190 (140 - 215)	92 (70 - 110)	57 (40 - 140)	71 (40 - 100)	180 (130 - 210)	50 (30 - 105)
Dissolved Oxygen (mg/l)	8.4 (6.6 - 10.6)	8.5 (7.1 - 11.5)	8.6 (7.4 - 11.1)	8.7 (7.3 - 11.4)	8.8 (7.3 - 11.6)	8.1 (5.4 - 12.2)	9.2 (7.5 - 13.4)	9.1 (7.7 - 13.5)	9.3 (7.4 - 11.6)	7.1 (4.0 - 12.2)
pH	7.0 (6.2 - 7.4)	7.1 (6.2 - 7.6)	7.1 (6.5 - 7.5)	7.2 (6.9 - 7.5)	7.2 (6.9 - 7.5)	7.0 (6.4 - 7.4)	7.0 (6.2 - 7.6)	7.2 (6.5 - 7.6)	7.2 (6.1 - 6.8)	6.5 (6.1 - 7.2)
Color Pt-Co Units	12 (5 - 20)	13 (8 - 18)	not measured	14 (9 - 20)	14 (9 - 22)	not measured	not measured	not measured	14 (5 - 23)	not measured

TABLE 3-1 (Continued)

PARAMETER	T - 5	R - 6	T - 6	R - 7	T - 7	R - 8	R - 9	$\bar{x}$
Temperature °C	23.0 (9.0 - 29.5)	23.5 (10.0 - 30.5)	23.0 (10.0 - 29.0)	23.3 (9.5 - 29.0)	23.0 (11.0 - 29.5)	23.8 (12.0 - 31.0)	23.8 (9.5 - 29.5)	23.2
Depth 1% Light Remains (feet)	not measured	5.8 (1.4 - 9.0)	not measured	6.3 (1.8 - 12.0)	not measured	7.4 (1.8 - 13.0)	7.8 (1.8 - 14.0)	7.1
Turbidity Hach FTU	11 (5 - 40)	15 (5 - 47)	12 (4 - 36)	17 (3 - 64)	12 (4 - 49)	15 (2 - 55)	15 (2 - 51)	14
Transparency Secchi Disc (meters)	not measured	0.6 (0.3 - 0.9)	not measured	0.7 (0.3 - 1.3)	not measured	0.7 (0.3 - 1.6)	0.8 (0.3 - 1.8)	0.8
ORP mV	398 (290 - 560)	400 (230 - 560)	394 (310 - 480)	410 (310 - 560)	374 (190 - 460)	410 (310 - 560)	410 (330 - 510)	400
Specific Conductance µmhos/cm @25°C	106 (30 - 160)	175 (120 - 210)	150 (50 - 200)	170 (135 - 215)	179 (40 - 410)	170 (130 - 215)	170 (135 - 215)	180
Dissolved Oxygen (mg/l)	8.7 (6.7 - 11.9)	9.0 (7.6 - 11.1)	8.5 (6.2 - 10.6)	8.4 (5.9 - 11.2)	8.1 (5.0 - 9.2)	8.2 (6.5 - 11.1)	8.5 (6.4 - 11.1)	8.6
pH S. U.	7.2 (6.6 - 8.5)	7.4 (6.9 - 8.4)	7.3 (6.2 - 8.4)	7.2 (6.7 - 7.7)	7.0 (5.7 - 8.1)	7.2 (6.7 - 8.5)	7.1 (6.8 - 7.6)	7.2
Color Pt-Co Units	not measured	16 (6 - 30)	not measured	15 (6 - 24)	not measured	15 (8 - 25)	14 (8 - 26)	14

TABLE 3-2. Means and Ranges of In-Situ and Associated Parameters Measured at Main River, Tributary and Discharge Stations, Middle Black Warrior River Stations R-10 thru R-16, (Lower Black Warrior River) July 1978 thru October 1979

PARAMETER	T - 8	R - 10	R - 11B*	R - 11A*	R - 12	R - 13	T - 9
Temperature °C	23.3 (9.5 - 32.0)	23.2 (7.5 - 29.5)	23.4 (9.0 - 29.5)	22.2 (8.5 - 29.5)	23.6 (9.0 - 29.5)	23.8 (9.0 - 30.5)	24.1 (11.0 - 30.0)
Depth 1% Light Remains (feet)	not measured	6.2 (1.7 - 10.0)	not measured	not measured	6.9 (1.8 - 11.0)	7.5 (1.9 - 15.0)	not measured
Turbidity (Hach FTU)	19 (6 - 51)	25 (3 - 133)	18 (2 - 54)	25 (2 - 96)	27 (2 - 160)	10 (2 - 25)	13 (2 - 33)
Transparency Secchi Disc (meters)	not measured	0.7 (0.2 - 1.8)	not measured	not measured	0.6 (0.3 - 1.2)	0.7 (0.1 - 1.3)	not measured
ORP mV	380 (290 - 480)	410 (300 - 520)	404 (310 - 520)	392 (310 - 470)	400 (330 - 490)	385 (320 - 490)	348 (270 - 420)
Specific Conductance µmhos/cm @25°C	218 (170 - 320)	170 (140 - 215)	170 (140 - 200)	166 (140 - 190)	170 (135 - 215)	170 (140 - 210)	213 (170 - 260)
Dissolved Oxygen (mg/l)	8.1 (5.5 - 11.2)	9.0 (7.6 - 11.8)	8.7 (6.8 - 11.8)	8.6 (7.0 - 11.5)	8.9 (7.0 - 11.6)	8.5 (7.3 - 11.0)	7.9 (3.8 - 13.0)
pH	7.5 (7.1 - 8.4)	7.1 (6.8 - 7.6)	7.2 (6.8 - 8.0)	7.1 (6.6 - 8.1)	7.1 (6.4 - 7.6)	7.2 (6.8 - 7.6)	7.9 (6.9 - 8.9)
Color Pt-Co Units	not measured	15 (7 - 27)	not measured	not measured	23 (9 - 110)	14 (10 - 24)	not measured

* B - Before dewatering A = After dewatering

TABLE 3-2 (Continued)

PARAMETER	D - 2	D - 3	R - 14	R - 15	T - 10	R - 16	$\bar{x}$
Temperature °C	27.1 (14.5 - 36.0)	26.0 (9.5 - 33.0)	25.0 (9.5 - 32.0)	24.9 (9.5 - 31.0)	24.3 (10.5 - 31.0)	26.1 (12.5 - 31.0)	24.4
Depth 1 *Light Remains* (feet)	not measured	not measured	7.2 (1.9 - 13.0)	7.9 (2.0 - 13.0)	not measured	7.5 (1.7 - 13.0)	7.2
Turbidity (Hach FTU)	14 (4 - 37)	15 (1 - 110)	26 (3 - 170)	22 (2 - 149)	21 (6 - 110)	23 (2 - 150)	22
Transparency Secchi Disc (meters	not measured	not measured	0.7 (0.4 - 1.2)	0.7 (0.2 - 1.2)	not measured	0.7 (0.1 - 1.2)	0.7
ORP mV	380 (320 - 460)	349 (180 - 470)	390 (290 - 480)	390 (290 - 490)	327 (280 - 410)	390 (320 - 490)	395
Specific Conductance umhos/cm @25°C	170 (140 - 205)	401 (230 - 480)	170 (140 - 200)	170 (140 - 190)	233 (190 - 300)	170 (140 - 180)	170
Dissolved Oxygen (mg/1)	8.5 (7.2 - 11.1)	8.4 (7.1 - 11.8)	8.5 (6.4 - 11.1)	8.6 (7.2 - 11.2)	9.2 (4.4 - 11.3)	8.3 (6.7 - 11.0)	8.6
pH S. U	7.2 (6.7 - 7.5)	6.5 (5.1 - 7.8)	7.3 (6.8 - 7.8)	7.2 (6.8 - 8.0)	8.3 (7.3 - 9.1)	7.3 (6.9 - 8.1)	7.[illegible]
Color Pt-Co Units	not measured	not measured	14 (9 - 25)	15 (9 - 26)	not measured	17 (9 - 34)	16

TABLE 3-3. Means and Ranges of In-Situ and Associated Parameters Measured at Main River, Tributary and Discharge Stations, Middle Tombigbee River, Stations R-17 thru R-21, (Tombigbee River), July 1978 thru October 1979

PARAMETER	R - 17	T - 11	R - 16	D - 4	R - 19	R - 20	T - 12	D - 5	R - 21	$\bar{x}$
Temperature °C	22.7 (7.5 - 31.0)	22.1 (9.0 - 29.5)	24.0 (10.5 - 30.0)	25.9 (10.5 - 32.0)	24.9 (12.5 - 31.0)	25.6 (12.0 - 32.5)	23.4 (9.0 - 29.0)	23.4 (9.5 - 31.0)	23.5 (10.0 - 30.0)	24
Depth 1% Light Remains (feet)	4.6 (0.8 - 9.0)	not measured	3.7 (0.5 - 9.0)	not measured	4.6 (0.2 - 13.0)	5.7 (0.3 - 13.0)	not measured	not measured	4.8 (0.5 - 10.0)	4.7
Turbidity (Hach FTU)	38 (2 - 195)	64 (20 - 158)	45 (2 - 180)	45 (3 - 140)	50 (3 - 180)	40 (3 - 180)	14 (3 - 50)	18 (6 - 70)	32 (3 - 135)	41
Transparency Secchi Disc (meters)	0.5 (0.1 - 1.2)	not measured	0.4 (0.1 - 0.8)	not measured	0.3 (0.1 - 0.9)	0.4 (0.1 - 0.9)	not measured	not measured	0.8 (0.1 - 1.0)	0.5
ORP mV	390 (270 - 480)	355 (220 - 440)	380 (290 - 480)	335 (255 - 380)	375 (280 - 480)	360 (250 - 460)	337 (260 - 440)	358 (275 - 460)	370 (260 - 480)	375
Specific Conductance umhos/cm @25°C	110 (75 - 165)	135 (70 - 170)	120 (90 - 170)	118 (30 - 170)	130 (90 - 170)	125 (35 - 175)	149 (50 - 180)	148 (110 - 170)	140 (100 - 170)	125
Dissolved Oxygen (mg/l)	8.5 (7.3 - 11.0)	7.4 (5.4 - 10.0)	8.0 (6.6 - 11.0)	8.5 (6.6 - 10.0)	7.5 (5.2 - 9.2)	7.6 (5.2 - 10.0)	8.9 (5.8 - 14.4)	8.0 (4.5 - 13.2)	7.5 (5.4 - 9.6)	7.8
pH S. U.	7.2 (6.2 - 7.5)	7.9 (7.3 - 8.3)	7.5 (7.1 - 8.3)	7.5 (6.9 - 8.7)	7.8 (7.1 - 8.5)	7.8 (7.1 - 8.9)	8.0 (7.3 - 9.0)	7.8 (7.2 - 8.8)	7.7 (7.1 - 8.6)	7.6
Color Pt-Co Units	34 (8 - 80)	not measured	33 (8 - 72)	not measured	40 (13 - 90)	33 (12 - 85)	not measured	not measured	45 (7 - 221)	37

TABLE 3-4. Means and Ranges of In-Situ and Associated Parameters Measured at Main River and Discharge Stations, Middle Black Warrior and Tombigbee Rivers, Stations R-22 thru R-23 (Demopolis Lake), July 1978 thru October 1979

PARAMETER	R - 22	D - 6	R - 23	$\bar{x}$
Temperature °C	23.3 (10.5 - 30.5)	24.4 (9.5 - 33.0)	25.1 (9.0 - 30.0)	24.2
Depth 1% Light Remains (feet)	6.9 (0.9 - 13.0)	not measured	6.8 (0.9 - 12.0)	6.9
Turbidity (Hach FTU)	23 (3 - 95)	24 (5 - 95)	24 (2 - 80)	24
Transparency Secchi Disc (meters)	0.6 (0.1 - 1.0)	not measured	0.6 (0.1 - 1.1)	0.6
ORP mV	390 (270 - 460)	354 (315 - 420)	390 (325 - 470)	390
Specific Conductance μmhos/cm @25°C	155 (130 - 200)	583 (130 - 1900)	160 (135 - 190)	158
Dissolved Oxygen (mg/l)	7.9 (5.5 - 10.1)	7.8 (5.1 - 10.0)	8.0 (5.8 - 10.4)	8.0
pH S. U.	7.3 (7.0 - 7.9)	7.4 (6.3 - 8.0)	7.3 (7.0 - 7.6)	7.3
Color Pt-Co Units	22 (9 - 43)	not measured	40 (8 - 210)	31

temperatures were recorded in February 1979 and ranged from 7.5°C at R-10 to 13.0°C at R-21 (Table A-5). The highest monthly temperatures occurred during August 1979, with a range of 28.0°C (recorded at several Warrior Lake stations) to 34.0°C recorded in the late afternoon at station R-14 (Table A-9). Temperatures greater than and equal to 27.0°C were recorded during August and September 1978 and June, July and August 1979 (see Appendix A).

Warrior Lake experienced the lowest mean temperature of the four river sections (23.2°C). The remaining river sections were approximately 1°C warmer on the average, with the lower Black Warrior River having the highest average, 24.4°C (Tables 3-1 through 3-4).

Euphotic Zone (Light Transmittance). The depth of the euphotic zone, which is defined as the depth of 99% incident light extinction, showed extensive variation between river sections and between sampling trips. The greatest mean euphotic zone was 9.0 feet at R-1 (Table 3-2); the lowest average depth of the euphotic zone was 3.7 feet at R-18 on the Tombigbee River (Table 3-3). The lowest monthly light transmittances were recorded in May 1979 (Table A-6); the greatest monthly values occurred in October 1978 (Table A-3). The single deepest euphotic zone was 15 feet (stations R-1 and R-13, October 1978, see Table A-3), the single shallowest was 0.2 feet (R-19, May 1979, see Table A-6).

The average depth of the euphotic zone was essentially equal in Warrior Lake and the Lower Black Warrior River (7.1 feet and 7.2 feet, respectively; see Tables 3-1 and 3-2). Demopolis Lake had only a slightly shallower euphotic zone (6.9 feet, see Table 3-4). The Tombigbee River was distinctly less transmissive with the average depth of the euphotic zone being 4.7 feet (Table 3-3), approximately 40% shallower than the other sections.

These sectional comparisons mask one overall trend in the Black Warrior River: Warrior Lake consistently had the greatest light transmittances with the deepest generally occurring at R-1. There was then a downstream decline in light transmittance between R-2 and R-6 (from an average of 9.0 feet at R-1 to 5.8 feet at R-6, see Table 3-1). The euphotic zone then gradually deepened to an average of 7.8 feet at R-9 (Table 3-1). The Lower Black Warrior River showed a similar trend with the station below Warrior Lock and Dam having a shallower euphotic zone than those stations closer to Demopolis Lake (e.g., the mean light transmittance at R-10 was 6.2 feet and at R-16 the mean was 7.5 feet; see Table 3-2). This trend is noticeable within most monthly data collections (see Appendix A).

Turbidity. Turbidity values evidenced large variations between both stations and dates. The lowest average turbidity, 8 FTU, was at R-19 (Table 3-3). The lowest monthly turbidities were recorded during October 1978 (Table A-3); the highest were during February 1979 (Table A-5). The minimum turbidity for the study was 2 FTU which occurred at R-18 and R-19 in August 1978 (Table A-1) and several other Black Warrior River stations in October 1978 (Table A-3). The maximum turbidity for the study was 195 FTU which occurred at R-17 in February 1979 (Table A-5).

The major trend among the river sections was increasing turbidity downstream. Warrior Lake had the lowest mean turbidity, 14 FTU (Table 3-1). The Lower Black Warrior River increased to 22 FTU (Table 3-2). The Tombigbee River yielded the highest average turbidity, 41 FTU (Table 3-3). Demopolis Lake had an average of 24 FTU (Table 3-4). Thus, the Tombigbee River had 40% - 55% greater turbidity than the other river sections.

Color. Color is measured in plantinum-cobalt color units. In this section the numerical values all refer to Pt-Co units.

Color values varied widely between sampling dates, river stations and river sections. The station with lowest average color, 12, was R-1 (Table 3-1); the highest was 45 at R-21 (Table 3-3). The minimum color value during the study was 5 (R-1 in July 1979, Table A-8, and R-5 in October 1979, Table A-10). The maximum color, 95, occurred at R-20 in October 1979 (Table A-10).

Similar to turbidity, color generally increased downstream on the Black Warrior River, rising from 14 in Warrior Lake to 16 in the Lower Black Warrior River. The Tombigbee River color levels averaged over 100% higher than the Black Warrior River with an average color value of 37. Demopolis Lake dropped only slightly lower than the Tombigbee River on the average (31) and was twice the color intensity of the Black Warrior River.

Transparency. The transparency, as measured by Secchi disc, evidenced much less variation than turbidity and light transmittance. The highest average transparency was 1.1 meters observed at R-1 (Table 3-1) and the lowest average transparency was 0.3 meters observed at R-19 (Table 3-3). The most transparent conditions were observed in October 1978 (Table A-3); the least in February 1979 (Table A-5). The single highest transparency was 2.2 meters (R-1, July 1979, Tables 3-1 and A-8). The minimum transparency recorded was 0.1 meters. This value was observed at several Tombigbee River Stations in February and May 1979 (Tables 3-3, A-5 and A-6).

Transparency generally decreased downstream, as compared between the river sections. However, the variation between the sections was not as distinct as it was for the other clarity measurements. Warrior Lake had the greatest transparency, 0.8 meters (Table 3-1) with a decrease to a 0.7 meters in the Lower Black Warrior River (Table 3-2) and 0.6 meters in Lake Demopolis (Table 3-4). The Tombigbee River, while not extremely less transparent, had the lowest average, 0.5 meters (Table 3-3). These trends support the general trend of decreasing clarity downstream on the Black Warrior River, with the Tombigbee River contributing water of a much lower clarity to Demopolis Lake which maintains a clarity influenced by both rivers.

Oxidation-Reduction Potential. The measurement of oxidation-reduction potential (ORP) produced very little variation between samplings, but larger variations between river stations and river sections. The greatest mean ORP was 410 mV at R-7 through R-10 (Tables 3-1 and 3-2). The lowest mean ORP was 360 mV at R-20 (Table 3-3). The highest ORP was 560 mV which occurred at R-6 during late August 1979 (Table A-9); the lowest was 230 mV at R-6, in December 1978 (Table A-4). The lowest monthly ORP values were recorded in December

1979 (Table A-4). The highest monthly ORP's were recorded in late August 1979 (Table A-9).

Between the river sections, only the Tombigbee River varied from the grand mean of approximately 400 mV. Warrior Lake and the Lower Black Warrior River averaged approximately 400 mV for the entire study (Tables 3-1 and 3-2). Demopolis Lake had an average of 390mV (Table 3-4). The Tombigbee River averaged only 6% lower, 375 mV (Table 3-3). These results demonstrate relatively equal ORP values for the entire study area averaged over the entire study period with the Tombigbee River having slightly lower ORP values (see monthly data in Appendix A).

Specific Conductance. As with ORP (see Table 3-1 through 3-4) variations were not extreme between river stations. The greatest variation occurred between dates. The highest specific conductance (conductivity) observed during the study was 215 μmhos/cm recorded at R-4 in October 1978 (Table A-3) and at R-7 through R-12 in October 1979 (Table A-10). The lowest conductivity was 35 μmhos/cm at R-20, August, 1978 (Table A-2).

Between the river sections, the Tombigbee River averaged a 30% lower conductivity than either Black Warrior River section or Demopolis Lake. The Black Warrior River averaged 180 μmhos/cm and 170 μmhos/cm for Warrior Lake and the Lower Black Warrior River, respectively (Tables 3-1 and 3-2). Demopolis Lake averaged slightly lower at 158 μmhos (Table 3-4). The Tombigbee River was consistently lower (Appendix A) with an average of 125 μmhos/cm (Table 3-3).

Dissolved Oxygen. Dissolved oxygen (DO) concentrations varied considerably by month, station and river section. Station R-5 had the highest average DO, 9.3 mg/l (Table 3-1). The lowest average DO was 7.5 mg/l at R-19 and R-21 (Table 3-3). The single highest DO was 11.8 mg/l observed at R-10 during an early morning (0937 hours) measurement in February 1979 (Table A-5). The lowest DO was 5.2 mg/l recorded at R-19 and R-20 in October 1978 (Table A-3). It should be noted that DO values almost as low were observed between stations R-19 and R-22 in August and October 1979 (Table A-9 and A-10, respectively).

Warrior Lake and the Lower Black Warrior River had equal mean DO levels, 8.5 mg/l (Tables 3-1 and 3-2). The Tombigbee River showed only a 9% reduction in average DO with 7.8 mg/l (Table 3-3). Demopolis Lake, with an average of 8.0 mg/l (Table 3-4), fell between the levels of the two rivers. This trend is evidenced in the monthly data collections (Appendix A) which show a general decrease in DO values in the Tombigbee River as compared to the Black Warrior River and Demopolis Lake.

pH. The pH showed the least variation of any of the in-situ parameters. The approximate median range was 6 8-7.8 S.U. for all river sections. The minimum average pH for this study was 7.0 S.U., recorded at R-1 (Table 3-1); the maximum was 7.8 S.U. at R-19 and R-20 (Table 3-5). The most basic pH value recorded during the study was 8.9 S.U. (Station R-20 during early and late August 1978, Tables A-1 and A-2). The most acidic pH measurement was 6.1 S.U. taken at R-5 (July 1978, Table A-1).

As with dissolved oxygen, grand average pH values were equal in the two Black Warrior River segments (7.2, Tables 3-1 and 3-2). The Tombigbee River was generally more basic, having an average pH of 7.6 S.U. (Table 3-3). Demopolis Lake pH was 7.3 S.U., on the average (Table 3-4). These trends are generally observable in the monthly data collections (see Appendix A).

Tributary and Discharge Stations

Results of in-situ measurements made at tributary and discharge stations during monthly data collections are found in Appendix C. Summaries of this data are found in Tables 3-1 through 3-4. The tributaries and discharges are listed as they occur between the river stations in each section. No attempt was made to calculate grand average of the tributaries in each river section due to the variations in the quality of the different influents.

Because of the lack of consistent trends in the river section, no presentation is made in this section regarding the effects of the tributaries and discharges on the rivers. The following results will therefore separate the results of the tributary and discharge measurements and the water quality impacts will be discussed in Section 4 of this report.

The following summary is presented as an aid to reading the following section. The reader should refer to Table 1-2 for more details on station locations.

TRIBUTARIES

Station	Source	Station	Source
T-1	Big Cypress Creek	T-7	Big Brush Creek
T-2	Little Sandy Creek	T-8	White Creek
T-3	Big Sandy Creek	T-9	Big Prairie Creek
T-4	Elliot's Creek	T-10	French Creek
T-5	Five Mile Creek	T-11	Noxubee Creek
T-6	Minters Creek	T-12	McConnico Creek

DISCHARGES

Station	Source	Station	Source
D-1	Tuscaloosa STP	D-4	Sumter Sand & Gravel Co.
D-2	Mouth of APCO Channel	D-5	Rivers City Industry
D-3	APCO pond discharge	D-6	Borden Chemical Co.

Water Temperature. The general trend for tributary stream temperatures refelcted the main river station temperature variations with a maximum average variation of approximately 3°C. The lowest average temperature was 20.7°C at T-2 (Table 3-1); the highest average was 24.3°C at T-10 (Table 3-2). The lowest temperature recorded was 6.5°C at T-2 and T-3 in December 1978 (Table C-4). The highest tributary stream temperature was 31.0°C recorded at T-10 in July 1979 (Table C-8).

Discharge stations had approximately the same range of variation from the river mean temperatures as did the tributary stations. D-2 had the highest average temperature, 27.1°C (Table 3-1). The lowest average discharge temperature was 23.4°C at D-5 (Table 3-3). The highest temperature recorded at a discharge station was 36.0°C at

D-2 in July and August 1979 (Tables C-8 and C-9); the lowest was 9.5^{o}C in December 1978 at D-5 and D-6 (Table C-4) and in February 1979 at D-3 (Table C-5).

Turbidity. Turbidity was the only measurement of clarity made at the tributary and discharge stations. T-11 had the highest average turbidity, 64 FTU (Table 3-3), of all tributary stations. The lowest average turbidity was 11 FTU, obtained at T-5 (Table 3-1). The single highest turbidity was 158 FTU, recorded at T-11 in May 1979 (Table C-6). The minimum turbidity was 1.7 FTU recorded at T-2 in August 1978 (Table C-2).

Discharge station average turbidities were generally lower than or equal to the average turbidities for the river sections. The lowest average turbidity was 14 FTU obtained at D-2 (Table 3-2), the highest average was 45 FTU, obtained at D-4 (Table 3-3). The single highest turbidity was 140 FTU, recorded at D-4 in February 1979 (Table C-5). D-3 had the lowest single turbidity, 1 FTU, recorded in July 1978 (Table C-1).

Oxidation-Reduction Potential. Oxidation reduction potential (ORP) values from tributaries showed no consistent trend in comparison to average river ORP measurements. The highest average tributary ORP was 398 mV at T-5 (Table 3-1). The lowest mean ORP for tributary stations was 327 mV, obtained at T-10 (Table 3-2). The maximum ORP value obtained for tributaries was 560 mV at T-5 in August 1979 (Table C-9); the minimum was 90 mV at T-4 in August 1978 (Table C-2).

Discharge station ORP values were consistently lower than the receiving river waters. D-1 and D-2 had the highest average ORP, 380 mV (Table 3-1 and 3-2, respectively). The lowest average ORP was 335 mV, obtained at D-4 (Table 3-3). The maximum ORP recorded for a discharge station was 470 mV (D-3, August 1979, Table C-9). The minimum ORP was 180 mV, recorded at D-3 during December 1978 (Table C-4).

Specific Conductance. Specific conductance had the widest ranges of any in-situ parameter measured at tributary or discharge stations. The lowest average conductivity reading at a tributary was 50 µmhos/cm, obtained at T-4 (Table 3-1); the highest was 233 µmhos/cm at T-10. The maximum conductivity recorded was 410 µmhos/cm at T-7 in August 1978 (Table C-1). The minimum recorded conductivity for a tributary station was 30 mV (T-4 and T-5, December 1978, Table C-4).

The discharge stations generally had average specific conductivity values higher than the receiving river waters. The greatest average discharge conductivity was obtained at D-6, 583 µmhos/cm (Table 3-4). The smallest average specific conductance was 118 µmhos/cm which was obtained at D-4 (Table C-3). The minimum discharge conductivity was also recorded at D-4, 30 µmhos/cm in August 1978 (Table C-1). The maximum recorded conductivity was at D-6, 1900 µmhos/cm in October 1979 (Table C-10).

Dissolved Oxygen. Tributary and discharge stations were generally ±1.0 mg/l of the receiving river water dissolved oxygen (DO) concentrations. The tributaries with the highest average DO concentrations were T-2 and T-10 with 9.2 mg/l (Tables 3-1 and 3-2). The lowest average DO

was 7.1 mg/l, obtained at T-4 (Table 3-1). T-9 had the lowest single DO level, 3.8 mg/l recorded in July 1978 (Table C-1). The highest DO, 14.4 mg/l was recorded at T-12 in June 1979 (Table C-7).

Discharge station D-1 had the highest average DO, 8.6 mg/l (Table 3-1). The lowest average DO was 7.8 mg/l obtained at D-6 (Table 3-4). The lowest monthly discharge station DO was 4.6 mg/l, recorded at D-5 (August 1978, Table C-1). The highest recorded discharge DO was 13.2 mg/l at D-5 (July 1979, Table C-8).

pH. The average pH values at all tributary and discharge stations were circumneutral (7.0 + 1.5 S.U.) The highest average pH was 8.3 S.U. at T-10 (Table 3-2); the lowest pH, 6.5 S.U., recorded at T-7 in February 1979 (Table C-5). The most basic single reading was 9.1 S.U. at T-10 (July 1978, Table C-1).

Discharge station pH values were not as varied as those obtained from the tributary stations. The highest average discharge pH was 7.8 S.U., obtained at D-5 (Table 3-3). The lowest average pH was 6.5 S.U., obtained at D-3 (Table 3-2). The most acidic station was D-3, with a pH of 5.1 S.U. in February 1979 (Table C-5). D-5 had the most basic pH reading, 8.8 S.U., in July 1979 (Table C-8).

3.1.1.2 Stratification and Mixing Studies

During the course of this study, three related data sets were obtained: Top and Bottom Comparison of In-Situ Parameters (see Appendix D), In-Situ Parameters Measured at Vertical Cross Section Stations R-8 and R-22 (see Appendix E) and Extensive Mixing Studies (see Appendix F). All three data collections involved making measurements of in-situ parameters in vertical profile along points of horizontal transects. The Top and Bottom Comparisons were begun in October 1978, the Vertical Cross Sections at R-8 and R-22 in July 1978 and Extensive Mixing Studies were done on the dates noted in 3.1.1.1.

Stratification at Main River Stations

The results of these studies indicate very little stratification of the Black Warrior or Tombigbee Rivers. Table 3-5 provides a summary of noticeable stratification in the form of changes in temperature and dissolved oxygen (DO) from surface to just above the river bottom. The most important observation to be made from Table 3-5 is that although temperature and DO do show some minor stratification at certain times, the overall loss of oxygen or temperature change is never severe. As shown in Appendices D and E, the depletion of DO to a level near 0 mg/l was never observed. Indeed the lowest DO recorded during the study was 4.2 mg/l at 15 meters (R-22, August 1978. Table E-4). Thus, stratification studies generally showed minor and gradual variation in surface versus bottom water quality parameters.

Further examination of Table 3-5 reveals the trends of what stratification was present in the Middle Black Warrior and Tombigbee Rivers. Both rivers appear to be well mixed vertically in both December 1978 and April 1979 with a maximum surface to bottom temperature difference of 3^{o}C at R-1 (Table D-2). It should be noted that the temperature difference is an increase from surface to bottom. The maximum DO decrease seen during these months is 1.3 mg/l (R-6,

Table 3-5. Summary of Significant Thermal-Oxygenation Stratification at Main River Stations on Selected Dates, Middle Black Warrior and Tombigbee Rivers, July 1978 through October 1979.

Station	Depth* (feet)	DEC 1978 Δ^oC	DEC 1978 ΔDO	APRIL 1979 Δ^oC	APRIL 1979 ΔDO	JULY 1979 Δ^oC	JULY 1979 ΔDO	OCT 1979 Δ^oC	OCT 1979 ΔDO
R-1	20	3.0	ND	0.5	0.2	0	0.1	0	0
R-2	20	0.5	ND	0	0	0	0	0	0
R-3	20	0	0.5	0	0.1	0	0.1	0	0.1
R-4	20	0	0.2	0	0	0	0	0	0
R-5	25	0	0.2	0	0.1	0.5	0.4	0	0
R-6	40	0	0.4	0	0.1	0	0	0	0
R-7	45	0	1.3	0.5	0.1	0.5	0.1	0	0.1
R-8	45	0	0	0.5	0	0	0.3	0	0.1
R-9	85	0	0.1	0	0	0.5	2.2	0	0
R-10	30	0	0.4	0	0.1	0.5	1.2	0	0
R-12	40	0.5	0.6	0	0.3	0.5	0.3	0	0
R-13	40	0	0.1	0.5	0.1	0.5	0	0	0
R-14	45	0	0.6	0.5	0	0.5	0.6	0	0
R-15	50	0	0.2	0	0.3	1.0	0.5	0	0.2
R-16	60	0	0.5	0	0	0.5	0.1	0	0
R-17	15	0	0	ND	ND	0.5	0	0	0
R-18	15	0	0	0	0	0	0.1	0	0
R-19	25	0	ND	0	0.1	0	0.3	0	0.4
R-20	50	0	ND	0	0	0.5	0.5	0.5	0.1
R-21	55	0.5	0.2	0	0	1.5	2.1	0	0
R-22	55	0	0.2	0.5	0	0.5	0.9	1.0	1.2
R-23	55	0.5	0.6	0	0	0.5	0.7	0	0.8

*From information provided by Mobile District, U.S. Army Corps of Engineers

ND = No data at station and date

December). This difference is obscured, however, by the DO supersaturation at the surface. By July 1979 these differences had increased such that several stations were displaying distinct, but still minor, vertical variation in DO and temperature.

Thermal stratification was apparent at several stations in July 1979. However, the average temperature decline was only 0.5°C with R-15 showing a full 1° lower at the bottom. At that same station, the DO showed only 0.5 mg/l decline (8.1 mg/l to 7.6 mg/l, Table D-6). R-21 showed a 1.5°C decline in temperature with a 2.1 mg/l decline in DO. R-9, immediately upstream of Warrior Lock and Dam, had the highest DO decline, 2.2 mg/l with a temperature drop of only 0.5°C. In October 1979 most stratification had disappeared. An exception was Demopolis Lake (R-22 and R-23) which showed some stratification during this month. Between the stations there was an average DO decline of 1.0 mg/l and an average temperature drop of 0.75°C. As noted, these stratifications appeared for the only time in Demopolis Lake during October 1979. However, as with all other stations at all other sampling times, stratification never increased to the point of producing a distinct thermo- or chemocline.

The stations showing the highest stratification were R-9 behind Warrior Lock and Dam, the stations of the Lower Black Warrior River; R-20 and R-21 on the Tombigbee River and R-22 and R-23 in Demopolis Lake. Between these sections, the Lower Black Warrior River had more consistent DO and temperature declines than any other section (see Appendix D). Warrior Lake and the Tombigbee River showed the least amount of stratification.

The other in-situ parameters measured during these data collections (specific conductance, pH and ORP) displayed very little vertical variation. During July 1979, the period with maximum thermal and oxygen depletion over depth, specific conductance showed no change through the vertical profile. pH values consistently dropped off with increasing depth in all river sections, however, this decrease rarely exceeded $\pm$ 0.5 units. ORP, a measurement of the electrochemical potential, generally increased as DO levels decreased. However, at the maximum DO depletion, ORP did not vary. Indeed, ORP varied more horizontally than vertically. Thus, the other in-situ parameters showed less stratification than the major stratification indicators, DO and temperature.

Extensive Mixing Studies

Extensive mixing studies were conducted during October 1978 and February and August 1979. The purpose of these studies was to determine the horizontal and vertical mixing of the river at all main stations. Thus, vertical profiles were taken at three points: near the right and left banks in the littoral zone and at mid-stream (over the deepest point). The results of these three data collections are presented in Appendix F.

Warrior Lake shows only minor vertical stratification during all three months. However, there are several instances of distinct horizontal stratification. In October 1978, surface water temperatures at station R-7 varied by 4°C from both littoral zones to mid-stream, with the littoral zones being colder (Table F-1). At R-5 during the

same month, DO showed an extreme horizontal variation. At the right bank the DO was supersaturated (11.0 mg/l). At mid-stream the DO fell off by 3.0 mg/l from the surface to the bottom. At the left bank the DO was only 5.6 mg/l throughout the entire water column. All other parameters were stable during this period at this station, except pH which was 2 units lower at the left bank than the right bank (see Table F-1). During February 1979, all parameters were relatively equal over both vertical and horizontal profiles (Table F-2). August 1979 measurements revealed only two major horizontal variations for parameters other than DO and temperature. Station R-6 recorded ORP values elevated by 25% (as compared to R-5) at all points (Table F-3). By station R-12 these elevated ORP had gradually returned to levels near those of R-5. At R-9, surface temperatures were elevated by about 3-5^{o}C in the littoral zones and DO levels were up to 1.0 mg/l higher in the river margins than that at mid-stream (Table F-3).

The Lower Black Warrior River showed different trends in vertical and horizontal stratification than Warrior Lake. One consistent difference between the two sections was the lowered DO levels to be found at the deepest part of mid-stream (see R-13 through R-16 on Tables F-1, F-2 and F-3). As noted in the previous section on stratification, this DO depletion with depth was greatest in the summer of 1979 (Table F-3) but never reached anaerobic levels at any station. The river was once again completely vertically mixed by the October 1979 sampling (Table D-7). Horizontal variation was less pronounced than in Warrior Lake. As with the upper section, littoral temperature in the lower Black Warrior River was occasionally different than the mid-stream temperatures. For example, for surface water temperatures at R-14 in October 1978, the littoral zones were 27^{o}C and the mid-stream 25^{o}C at the surface (see Table F-1). DO also showed similar horizontal stratification on the upper and lower sections, but no extreme transect variations were observed. At R-12 in August 1979, (Table F-3) the littoral zone surface DO was approximately 0.6^{o}C higher than the midstream surface DO. This example is one of the larger variations (see Table F-1 through F-3). Thus, while the results of extensive mixing showed less horizontal variability in the Lower Black Warrior River as compared to the upper section, they did reveal the increased vertical stratification in this reach of the Black Warrior below Warrior Lock and Dam.

The Tombigbee River extensive mixing studies revealed both horizontal and vertical stratification. In October 1978, R-17 was well mixed in both dimensions (Table F-1). R-18, however, showed significatnt horizontal variation between the mid-stream and right bank. Midstream surface DO concentrations were 2.0 mg/l lower than the right bank surface levels. This lower DO was then observed at the left bank and mid-stream with surface DO concentrations at the right bank being elevated to near saturation. By R-20 the horizontal variation was gone but the DO levels were suppressed (5.2 to 5.6 mg/l). At R-21, the DO showed some recovery, rising to 6.0 - 6.8 mg/l at the surface. As with the Black Warrior River, all in-situ parameters showed near complete mixing during the February 1979 (Table F-2) sampling. In August 1979 (Table F-3) most stations showed nearly equal emperatures, both horizontally and vertically, with variation in temperature generally ranging up to 2^{o}C. The largest horizontal temperature variation was at R-20 which had a 3^{o}C variation between the littoral zone (31.5^{o}C at the right bank) and the midstream (28.5^{o}C).

In general, littoral zone temperatures were warmer and mid-stream deep water temperatures were colder within this range. R-20 also had the greatest variation in DO levels with a 2 mg/l horizontal variation (high littorals and low mid-stream) and a 2-3 mg/l vertical difference. Other parameter exhibited only a minor degree of stratification.

Demopolis Lake showed very little vertical or horizontal stratification during either the October 1978 or February 1979 surveys (see Tables F-1 and F-2). In August 1979 at R-22 (Table F-3), there was a distinct surface DO drop at mid-stream and the left bank as compared to the surface DO at the right bank. At R-23 during the same month, all surface DO concentrations were noticeably lower than normal. Temperature variations at these stations in August were only $1^{o}C$, with the littoral zones being warmer. All other in-situ parameters were well-mixed during all samplings.

Extensive mixing studies conducted at main river stations revealed varying patterns of horizontal and vertical stratification. Water temperature evidenced significant stratification in the summer with the littoral zones and the surface water being the warmest. Winter water temperatures were essentially equal throughout the river. DO levels were seen to have significant horizontal stratifications with vertical stratifications being small and mostly related to stream depth. All other in-situ parameters were approximately equal during each sampling with only slight variations occurring between seasons (see Section 3.1.1.1).

3.1.1.3 Major Ions and Associated Parameters

The presentation of results for this Section and Sections 3.1.1.4 through 3.1.1.6 encompass data contained in Appendices A and B. These are raw data for chemical analyses and quality control support data, respectively. In contrast to the presentaion in Section 3.1.1.1, the following results concern only main river stations since tributary stations were monitored for in-situ parameters only.

Alkalinity. Alkalinity (4.5 S.U.) evidenced stable levels in all rivers and varied only slightly during the study. The highest mean alkalinity was 43 mg/l (all units as $CaCO_3$) observed at R-20 and R-21 on the Tombigbee River (Table 3-8). The station having the lowest mean alkalinity was R-13, with 23 mg/l (Table 3-7). R-20 had the highest alkalinity recorded, 59 mg/l in early and late August 1978 (Table A-1 and A-2). R-13 had the lowest alkalinity, 23 mg/l, recorded in October 1978 (Table A-3).

The river sections also had stable alkalinities, with the grand means showing little variation from the station means. The Tombigbee River had the highest average alkalinity, 41 mg/l (Table 3-8). Demopolis Lake had the second highest average value, 28 mg/l (Table 3-9). This value was very close to that of Warrior Lake, which had an average alkalinity of 26 mg/l (Table 3-7). The Lower Black Warrior River average alkalinity dropped off slightly, being 24 mg/l (Table 3-6). These conditions indicate a very stable alkalinity for the rivers through the seasons and within the sections.

Calcium. The levels of calcium observed in the Middle Black Warrior and Tombigbee Rivers were highly variable but showed a consistent pattern.

TABLE 3-6. Means and Ranges of Major Ions and Associated Parameters at Main River Stations, Middle Black Warrior River, Stations R-1 thru R-9 (Warrior Lake), July 1978 thru October 1979

PARAMETER	R - 1	R - 2	R - 3	R - 4	R - 5	R - 6	R - 7	R - 8	R - 9	$\bar{x}$
Alkalinity (mg/l)	26 (18 - 31)	26 (18 - 31)	27 (19 - 30)	26 (18 - 32)	25 (18 - 32)	26 (17 - 31)	25 (17 - 30)	25 (17 - 30)	26 (17 - 39)	26
Calcium (mg/l)	12.3 (7.0 - 17.4)	11.3 (6.5 - 16.4)	12.3 (8.4 - 16.3)	11.7 (6.2 - 16.8)	11.5 (6.3 - 14.2)	11.2 (5.5 - 15.9)	10.7 (5.7 - 16.8)	10.0 (4.1 - 15.2)	9.6 (4.3 - 14.8)	10.2
Magnesium (mg/l)	5.91 (3.2 - 8.2)	6.01 (3.4 - 8.3)	5.89 (3.4 - 7.6)	5.91 (3.3 - 7.7)	5.40 (3.2 - 7.2)	5.21 (3.3 - 6.8)	5.12 (3.1 - 6.8)	4.99 (3.2 - 6.4)	4.87 (3.2 - 6.5)	5.48
Hardness (calc.) (mg/l $CaCO_3$)	59 (45 - 78)	54 (43 - 76)	70 (50 - 87)	55 (45 - 75)	55 (43 - 67)	52 (41 - 69)	50 (38 - 71)	47 (36 - 65)	46 (36 - 64)	54
Chlorides (mg/l)	5 (4 - 6)	5 (4 - 7)	5 (4 - 5)	6 (4 - 9)	5 (3 - 6)	6 (3 - 8)	6 (3 - 8)	8 (3 - 11)	7 (3 - 10)	6
Potassium (mg/l)	2.26 (1.87 - 2.70)	2.19 (1.70 - 2.60)	2.11 (1.73 - 2.40)	2.25 (1.88 - 2.50)	2.11 (1.70 - 2.40)	2.21 (1.84 - 2.40)	2.04 (1.54 - 2.30)	2.13 (1.57 - 2.50)	1.98 (1.49 - 2.24)	2.14
Sodium (mg/l)	9.17 (7.84 - 9.88)	9.16 (7.28 - 10.70)	9.13 (7.77 - 10.32)	9.61 (7.70 - 10.02)	9.19 (7.12 - 10.26)	9.37 (7.31 - 11.40)	9.26 (7.40 - 10.20)	9.31 (7.05 - 10.80)	8.85 (6.46 - 10.68)	9.23
Dissolved Sulfates (mg/l)	47 (32 - 57)	47 (30 - 56)	47 (31 - 57)	47 (31 - 56)	44 (28 - 55)	42 (26 - 60)	42 (30 - 65	38 (28 - 60)	40 (28 - 60)	44
Sulfides (mg/l)	0.3 (<0.1 - 2.1)	0.2 (<0.1 - 1.6)	0.8 (<0.1 - 5.8)	0.2 (<0.1 - 1.7)	0.2 (<0.1 - 1.0)	0.3 (<0.1 - 1.6)	0.1 (<0.1 - 0.2	0.1 (<0.1 - 0.5)	0.2 (<0.1 - 0.8)	0.3

TABLE 3-6 (Continued)

PARAMETER	R - 1	R - 2	R - 3	R - 4	R - 5	R - 6	R - 7	R - 8	R - 9	$\bar{x}$
Residue, Total Filterable (mg/l)	121 (84 - 149)	121 (62 - 148)	119 (85 - 146)	118 (98 - 142)	108 (96 - 135)	107 (91 - 123)	111 (75 - 170)	97 (81 - 147)	117 (81 - 155)	113
Residue, Total Nonfilterable (mg/l)	8 (2 - 13)	9 (1 - 17)	14 (2 - 32)	16 (4 - 28)	24 (12 - 54)	19 (10 - 28)	18 (1 - 35)	24 (4 - 92)	16 (3 - 21)	16
CO_2 (calc.) (mg/l)	7.5 (1.5 - 32.0)	4.9 (1.6 - 16.0)	3.5 (1.5 - 6.0)	4.0 (1.8 - 7.0)	6.1 (<0.1 - 34.0)	2.8 (0.2 - 6.0)	3.6 (1.0 - 7.0)	4.5 (1.6 - 8.5)	4.2 (2.0 - 8.0)	4.6

TABLE 3-7. Means and Ranges of Major Ions and Associated Parameters at Main River Stations, Middle Black Warrior River, R-10 thru R-16 (Lower Black Warrior River), July 1978 thru October 1979

PARAMETER	R - 10	R - 12	R - 13	R - 14	R - 15	R - 16	$\bar{x}$
Alkalinity (mg/l)	25 (18 - 31)	24 (18 - 28)	23 (13 - 30)	24 (17 - 27)	25 (17 - 34)	24 (16 - 28)	24
Calcium (mg/l)	9.1 (3.4 - 15.2)	10.4 (5.3 - 15.5)	6.3 (1.1 - 14.1)	9.8 (4.1 - 14.8)	10.3 (4.8 - 14.9)	9.9 (4.7 - 12.8)	9.3
Magnesium (mg/l)	5.46 (3.2 - 6.8)	5.26 (3.2 - 6.5)	4.89 (3.2 - 5.8)	5.18 (3.1 - 6.6)	5.03 (3.3 - 6.4)	4.88 (3.2 - 6.3)	5.12
Hardness (calc.) (mg/l $CaCO_3$)	52 (36 - 65)	52 (41 - 65)	52 (42 - 59)	52 (41 - 62)	51 (41 - 60)	51 (45 - 54)	52
Chlorides (mg/l)	7 (3 - 9)	7 (3 - 9)	7 (3 - 8)	7 (3 - 8)	7 (3 - 8)	6 (3 - 8)	7
Potassium (mg/l)	2.32 (1.47 - 3.20)	2.19 (1.55 - 2.71)	2.27 (1.60 - 3.02)	2.19 (1.50 - 2.98)	2.23 (1.61 - 2.78)	2.19 (1.64 - 2.82)	2.23
Sodium (mg/l)	9.19 (7.34 - 10.64)	9.46 (6.83 - 11.00)	9.23 (7.44 - 11.14)	9.14 (7.38 - 10.84)	9.17 (7.25 - 10.56)	9.63 (6.99 - 11.30)	9.30
Dissolved Sulfates (mg/l)	40 (28 - 60)	40 (31 - 60)	40 (31 - 55)	39 (32 - 50)	39 (30 - 50)	37 (28 - 43)	39
Sulfides (mg/l)	0.1 (<0.1 - 0.1)	0.2 (<0.1 - 1.0)	0.6 (<0.1 - 4.6)	0.1 (<0.1 - 0.3)	0.1 (<0.1 - 0.3)	0.4 (<0.1 - 3.0)	0.3

TABLE 3-7 (Continued)

PARAMETER	R - 10	R - 12	R - 13	R - 14	R - 15	R - 16	$\bar{x}$
Residue, Total Filterable (mg/l)	116 (10 - 171)	113 (90 - 140)	108 (93 - 121)	104 (74 - 121)	180 (71 - 903)	108 (80 - 122)	122
Residue, Total Nonfilterable (mg/l)	30 (6 - 176)	29 (4 - 166)	32 (<1 - 217)	27 (3 - 164)	24 (2 - 151)	25 (4 - 154)	28
CO_2 (calc.) (mg/l)	6.5 (1.0 - 24.0)	5.2 (1.3 - 17.0)	3 5 (0.6 - 7.0)	2.6 (0.8 - 6.0)	3.5 (0.6 - 8.0)	3.6 (0.6 - 8.0)	4.2

TABLE 3-8. Means and Ranges of Major Ions and Associated Parameters at Main River Stations, Middle Tombigbee River, Stations R-17 thru R-21 (Tombigbee River), July 1978 thru October 1979

PARAMETER	R - 17	R - 18	R - 19	R - 20	R - 21	$\bar{x}$
Alkalinity (mg/l)	36 (21 - 49)	40 (21 - 50)	42 (32 - 52)	43 (25 - 54)	43 (25 - 54)	41
Calcium (mg/l)	15.2 (8.3 - 21.5)	15.4 (7.5 - 21.2)	16.7 (8.1 - 22.9)	17.4 (9.8 - 23.5)	17.8 (11.4 - 22.0)	16.5
Magnesium (mg/l)	2.03 (1.1 - 3.2)	2.09 (1.3 - 3.1)	2.18 (1.4 - 3.5)	2.18 (1.4 - 3.4)	1.99 (1.6 - 2.7)	2.12
Hardness (calc) (mg/l $CaCO_3$)	54 (45 - 64)	58 (51 - 64)	62 (50 - 68)	63 (54 - 69)	60 (58 - 63)	59
Chlorides (mg/l)	10 (2 - 14)	9 (2 - 15)	8 (2 - 14)	10 (2 - 14)	9 (2 - 11)	9
Potassium (mg/l)	2.20 (1.36 - 3.25)	2.22 (1.33 - 3.32)	2.22 (1.27 - 3.48)	2.10 (1.27 - 2.94)	2.03 (1.24 - 2.94)	2.15
Sodium (mg/l)	6.62 (5.36 - 8.90)	5.46 (2.55 - 8.64)	5.95 (2.80 - 9.36)	6.06 (3.72 - 9.36)	5.81 (3.72 - 9.02)	5.98
Dissolved Sulfates (mg/l)	9 (6 - 10)	8 (2 - 11)	8 (3 - 10)	7 (1 - 10)	10 (2 - 15)	8
Sulfides (mg/l)	0.3 (<0.1 - 2.1)	0.3 (<0.1 - 1.8)	0.3 (<0.1 - 1.5)	0.2 (<0.1 - 1.5)	0.2 (<0.1 - 0.4)	0.3

TABLE 3-8 (Continued)

PARAMETER	R - 17	R - 18	R - 19	R - 20	R - 21	$\bar{x}$
Residue, Total Filterable (mg/l)	76 (67 - 129)	78 (57 - 125)	106 (72 - 118)	98 (84 - 116)	95 (94 - 131)	91
Residue, Total Nonfilterable (mg/l)	47 (4 - 255)	58 (9 - 242)	78 (4 - 308)	77 (7 - 330)	45 (7 - 221)	61
CO_2 (calc.) (mg/l)	4.7 (1.5 - 10.0)	3.2 (0.5 - 5.3)	2.4 (0.2 - 5.3)	2.9 (0.1 - 6.0)	3.0 (1.0 - 5.2)	3.2

TABLE 3-9. Means and Ranges of Major Ions and Associated Parameters at Main River Stations, Middle Black Warrior and Tombigbee Rivers, Stations R-22 and R-23 (Demopolis Lake), July 1978 thru October 1979

PARAMETER	R - 22	R - 23	$\bar{x}$
Alkalinity (mg/l)	27 (17 - 39)	29 (12 - 42)	28
Calcium (mg/l)	12.4 (5.9 - 19.0)	13.8 (5.9 - 13.8)	13.1
Magnesium (mg/l)	3.80 (3.2 - 4.4)	3.41 (2.8 - 4.4)	3.61
Hardness (calc) (mg/l $CaCO_3$)	56 (51 - 62)	56 (51 - 64)	56
Chlorides (mg/l)	7 (3 - 8)	8 (3 - 8)	8
Potassium (mg/l)	2.53 (1.90 - 3.17)	2.14 (1.45 - 2.98)	2.34
Sodium (mg/l)	5.66 (5.03 - 6.30)	7.59 (5.03 - 10.64)	6.63
Dissolved Sulfates (mg/l)	28 (15 - 44)	25 (12 - 38)	27
Sulfide (mg/l)	0.2 (<0.1 - 1.1)	0.1 (<0.1 - 0.3)	0.2

TABLE 3-9 (Continued)

PARAMETER	R - 22	R - 23	$\bar{x}$
Residue, Total Filterable (mg/l)	108 (95 - 116)	113 (99 - 129)	111
Residue, Total Nonfilterable (mg/l)	29 (1 - 166)	27 (2 - 126)	28
CO_2 (calc.) (mg/l)	3.5 (1.3 - 5.1	3.6 (0.9 - 5.3)	3.6

Station R-21 had the highest average calcium levels, 17.8 mg/l (Table 3-8). The lowest average calcium level was 6.3 mg/l observed at R-13 (Table 3-7). The single highest calcium concentration was 23.5 mg/l, recorded at R-20 in August 1979 (Table A-9); the single lowest was 3.4 mg/l at R-10 in February 1979 (Table A-5). Despite the magnitude of variation, one consistent trend was that all stations recorded higher calcium concentrations in the two August trips (Tables A-2 and A-9) than in February 1979 (Table A-5).

The Tombigbee River ahd the highest grand average for calcium, 16.5 mg/l (Table 3-8). Demopolis Lake with an average calcium concentration of 13.4 mg/l (Table 3-9) had the second highest mean. The Black Warrior River had 10.2 (Table 3-6) and 9.3 mg/l (Table 307) for the lake and the lower section, respectively. As noted above, the river sections showed high seasonal variability with summer maxima and early spring minima.

Magnesium. Concentrations of magnesium showed little variation, but a consistent seasonal trend. However, this trend was distinctly different than that noted for calcium (see above).

The station yielding the highest average magnesium concentration was R-2 (6.01 mg/l, Table 3-6). R-21 had the lowest average magnesium concentration, 1.99 mg/l (Table 3-7). The single highest magnesium level recorded was 8.3 mg/l at R-2 in August 1979 (Table A-9). The lowest value recorded for magnesium was 1.1 mg/l at R-17 in August 1978 (Table A-2). Considering all data, minimum concentrations for magnesium were recorded in August 1978 (Table A-2) and the maximum level in August 1979 (Table A-9).

Between the river sections, Warrior Lake had the highest average magnesium concentration, 5.48 mg/l (Table 3-6). The Lower Black Warrior River was slightly lower, 5.12 mg/l (Table 3-7). Demopolis Lake had a decrease of approximately 40% in magnesium concentrations with an average of 3.61 mg/l (Table 3-9). The Tombigbee River had the lowest average magnesium level, 2.12 mg/l (Table 3-8).

As stated above, magnesium displayed one pervasive trend. This was a rising magnesium level in Warrior Lake during the period of the study (see Tables A-2, A-5 and A-9). In contrast, stations R-10 through R-23 showed a trend similar to that noted for calcium: a peak in February 1979 (Table A-5), with a return to the August 1978 levels. During each sampling cited above the magnesium values rose steadily (progressing upstream).

Hardness (Calculated). Hardness had the least variation of any of the indicators of dissolved substances and generally displayed a trend similar to that of calcium. The station with the highest average hardness was R-3 (Table 3-6) with 70 mg/l (all units as $CaCO_3$). The lowest average hardness was 46 mg/l observed at R-9 (Table 3-8). The maximum hardness was 87 mg/l recorded at R-3 in August 1978 (Table A-2). The minimum hardness was 36 mg/l which was recorded at R-10 in August 1978 (Table A-2). Generally, the lowest hardness occurred in February 1979 (Table A-5) and the highest occurred in August 1979 (Table A-9).

Although differences were slight, the Tombigbee River had the highest average hardness, 59 mg/l (Table 3-8) Demopolis Lake had an

average of 56 mg/l (Table 3-9). As with calcium, hardness in the Black Warrior was slightly higher in Warrior Lake (54 mg/l, Table 3-6) than the lower section (52 mg/l, Table 3-7). This trend is somewhat similar to that of calcium (see above) which is the major component of the calculated hardness.

Chlorides. The levels of chlorides observed during the study show both seasonal and sectional trends. The highest average chloride value was 10 mg/l, observed at two stations on the Tombigbee River, R-17 and R-20 (Table 3-8). The lowest average value was 5 mg/l observed at R-1, R-2, R-3 and R-5 (Table 3-6). The maximum chloride concentration recorded was 15 mg/l (R-18, August 1978, Table A-2). The minimum chloride concentration, 2 mg/l was recorded at all Tombigbee River Stations in February 1979 (Table A-5). Considering all chloride data, the lowest chloride concentrations were recorded in February 1979 (Table A-5). Overall maximum chloride concentrations were recorded in August 1978 (Table A-2).

The Tombigbee River had the highest grand average chloride concentration, 9 mg/l (Table 3-8). Warrior Lake and Lower Black Warrior River averaged 6 mg/l (Table 3-6) and 7 mg/l (Table 307), respectively. Demopolis Lake averaged between the two rivers, 8 mg/l (Table 3-9). These results indicate a seasonal fluctuation in chloride levels within the river sections which are moderately different from each other.

Potassium. Potassium, one of the major vascular plant nutrients, showed very little variation between both seasons and river sections. Tables 3-6 through 3-9 show the average sectional variation is $\leq$ 0.2 mg/l.

The station with the highest average potassium level was R-22 (2.53 mg/l, Table 3-9). The lowest average concentration was 1.98 mg/l potassium recorded at R-9 (Table 3-6). The maximum potassium concentration recorded was 3.52 mg/l (R-20, February 1979, Table A-5); the lowest was 1.24 mg/l at R-21 (August 1978, Table A-2). Generally, the lowest potassium concentrations were observed in August 1978 (Table A-2) and the highest in February 1979 (Table A-5).

Demopolis Lake had the highest grand average for potassium, 2.34 mg/l (Table 3-9). The Tombigbee River had 2.15 mg/l (Table 3-8) on the average. The Lower Black Warrior River (Table 3-7) had the second highest average 2.23 mg/l and Warrior Lake the lowest average, 2.14 mg/l (Table 3-6). The August 1978 and August 1979 trips (Tables A-2 and A-9, respectively) showed higher potassium values in the Black Warrior River basin than the Tombigbee River basin. The opposite situation occurred during the February collection (Table A-5). However, as previously stated, the differences are very small making potassium the most equally distributed element between the river basins.

Sodium. Sodium concentrations varied about 30% between both seasons and river sections. The highest average sodium concentration, 9.63 mg/l, was observed at R-16 (Table 3-7). The lowest average, 5.46 mg/l, occurred at R-18 (Table 3-8). The maximum sodium value recorded was 11.40 mg/l (R-6, Table A-2); the minimum, 0.68 mg/l, was recorded at R-9 (Table A-2). Both values were recorded during August 1978. Overall, the minimum sodium levels were observed in February 1979 (Table A-5) and the maximum in August 1978 (Table A-2).

Warrior Lake and the Lower Black Warrior River had the highest average sodium levels, 9.23 mg/l (Table 3-6_ and 9.30 mg/l (Table 3-7), respectively. The Tombigbee River was approximately 40% lower, with a grand average of 5.98 mg/l (Table 3-8). Demopolis Lake had an average sodium concentration of 6.63 mg/l (Table 309). These results show only moderate variation between the river sections, with seasonal variations being more noticeable.

Dissolved Sulfates. Sulfates showed a greater seasonal variation, up to 200%, than any of the other ions investigated. The greatest average sulfate value observed was 47 mg/l (R-1 through R-4, Table 3-6). The lowest average sulfate value was 7 mg/l (R-20, Table 3-8). The maximum concentration of sulfate recorded was 65 mg/l at R-7 in October 1979 (Table A-10). The minimum sulfate level, 1 mg/l, was recorded at R-20 in August 1979 (Table A-9). Considering all stations, the lowest sulfate concentrations were observed in May 1979 (Table A-6) and the highest in October 1979 (Table A-10).

Sulfate values were the highest in Warrior Lake, averaging 44 mg/l for the study period (Table 3-6). The sulfate levels fell off slightly in the Lower Black Warrior River, with a grand average of 39 mg/l (Table 3-7). The Tombigbee River had the lowest average sulfate level, 8 mg/l (Table 3-8). Demopolis Lake had an intermediate sulfate average, 27 mg/l (Table 3-9). These results indicate a much greater variation in sulfate levels between river basins than between seasons.

Sulfides. Sulfide was an unusual parameter in that it was often below detectable limits (0.01 - 0.02 mg/l) but was occaionally quite high. The station with the highest average sulfide level was R-3 which had an average of 0.8 mg/l (Table 3-6). The lowest average sulfide was 0.1 mg/l recorded at stations in all river sections except the Tombigbee River (see Tables 3-6 through 3-9). As stated, the lowest sulfide concentration measured was non-detectable (<0.01 mg/l), which occurred at every station on several occasions (Appendix A). Overall, the lowest sulfide levels were in October 1978 (Table A-3), February 1979 (Table A-5) and May 1979 (Table A-6) when all stations had <0.01 mg/l sulfide. June 1979 (Table A-7) and October 1979 (Table A-10) had over 90% of the stations with <0.01 mg/l sulfide. However, June 1979 also recorded the highest sulfide concentration, 5.8 mg/l, at R-3 (Table A-7). (Note: The second highest sulfide level was also recorded in June 1979, 4.6 mg/l at R-13, this was 100% larger than the next highest value 2.1 mg/l recorded R-1 in August 1978, see Table A-2). August 1978 had the highest overall sulfide values (Table A-2).

The grand averages of the river sections showed very little variation between them. The Black Warrior River and the Tombigbee River had equal averages, 0.3 mg/l (Table 3-6, 3-7 and 3-8). Demopolis was slightly lower having an average of 0.2 mg/l (Table 3-9). Thus, sulfide concentrations were much more variable between seasons than between river sections.

Total Filterable Residue (Dissolved Solids). Levels of dissolved solids were relatively stable within each river section but had a moderate amount of seasonal variation. The highest average amount of dissolved solids occurred at R-15 (180 mg/l, Table 3-7). R-17 had the lowest average dissolved solids level, 76 mg/l. The maximum dissolved solids concentration was 903 mg/l, recorded at R-15 in May 1979 (Table A-6); the minimum was 20 mg/l at R-10 in May 1979 (Table 6). The highest

overall dissolved solids levels were observed in October 1979 (Table A-10) and the lowest in May 1979 (Table A-6).

The Black Warrior River had the highest average dissolved solids levels of the river sections. The Lower Black Warrior River had the highest average, 122 mg/l (Table 3-7). Warrior Lake had a slightly lower value, 113 mg/l (Table 3-6). Demopolis Lake, with an average of 111 mg/l (Table 3-9), fell just between the Black Warrior and the Tombigbee River which had the lowest average, 91 mg/l (Table 3-8).

Total Non-filterable Residue (Suspended Solids). Suspended solids evidenced much greater variation than dissolved solids. R-19 had the highest average suspended solids load, 78 mg/l (Table 3-8). The lowest average suspended solids level, 8 mg/l, was observed at R-1 (Table 3-6). The single highest suspended solids concentration was 330 mg/l, recorded at R-20 in February 1979 (Table A-5). The minimum suspended solids concentration was <1 mg/l, recorded at R-13 in October 1978 (Table A-3). The highest monthly suspended solids loads were observed in February 1979 (Table A-5); the lowest were in October 1978 (Table A-3).

The Tombigbee River had the highest grand average for suspended solids, 61 mg/l (Table 3-8). The Lower Black Warrior and Demopolis Lake had equal levels, 28 mg/l (Table 3-7 and 3-9, respectively). Warrior Lake carried the lowest average suspended solids loading, 16 mg/l (Table 3-6). These results show extreme variations in suspended solids loading, both between seasons (the greatest variation) and between river sections.

Free Carbon Dioxide (Calculated). Average values for free carbon dioxide (CO_2), show little variation between river sections, but rather large variations between seasons. The station with the highest average CO_2, 7.5 mg/l, was R-1 (Table 3-6). R-19 had the lowest average CO_2, 2.4 mg/l (Table 3-7). The highest recorded CO_2 level was 34 mg/l at R-5 in July 1978 (Table A-1). The lowest CO_2 was <0.1 mg/l, recorded at R-5 in October 1978 (Table A-3). October 1979 also had the overall lowest CO_2 values. The highest CO_2 values for the study were observed in February 1979 (Table A-5).

Warrior Lake had the highest grand average for CO_2, 4.6 mg/l (Table 3-6). The Lower Black Warrior River had slightly lower concentration of CO_2, with a study period average of 4.2 mg/l (Table 3-7). Demopolis had an average of 3.6 mg/l (Table 3-8) and the Tombigbee was consistently the lowest, with an average of 3.2 mg/l (Table 3-9). These variations between sections are minor, compared to the larger variations which were observed between seasons.

3.1.1.4 Nutrients

Nutrients, as defined in this section, are confined to various components and compounds considered in the nitrogen series, dissolved orthophosphate and total phosphorus. Summarized data for nutrient concentrations are found in Tables 3-10 through 3-13 in this section. Raw data from the monthly samplings are found in Appendix A.

Ammonia. Concentrations of ammonia had considerable seasonal variation with only minor variation within and between sections. R-15

TABLE 3-10. Means and Ranges of Nutrients at Main River Stations, Middle Black Warrior River, Stations R-1 thru R-9 (Warrior Lake), July 1978 through October 1979

PARAMETER	R - 1	R - 2	R - 3	R - 4	R - 5	R - 6	R - 7	R - 8	R - 9	$\bar{x}$
Ammonia-N (mg/l)	0.13 (0.05 - 0.23)	0.12 (0.05 - 0.21)	0.11 (0.01 - 0.25)	0.13 (0.06 - 0.24)	0.11 (0.05 - 0.21)	0.09 (0.03 - 0.18)	0.11 (0.06 - 0.28)	0.10 (0.01 - 0.18)	0.10 (0.01 - 0.20)	0.11
Nitrate-Nitrite-N (mg/l)	0.64 ([illegible]33 - 0.94)	0.64 (0.40 - 1.08)	0.64 (0.36 - 0.97)	0.67 (0.41 - 1.10)	0.56 (0.36 - 0.93)	0.53 (0.26 - 1.08)	0.50 (0.20 - 0.96)	0.50 (0.17 - 1.19)	0.50 (0.16 - 1.16)	0.58
Total Kjeldahl-N (mg/l)	0.43 (0.10 - 1.00)	0.40 (0.20 - 1.10)	0.41 (0.10 - 1.[illegible]0)	0.42 (0.10 - 0.80)	0.44 (0.10 - 0.70)	0.40 (0.20 - 1.00)	0.50 (0.20 - 1.00)	0.38 (0.10 - 0.60)	0.56 (0.10 - 1.10)	0.44
Total Inorganic-N (calc.) (mg/l)	0.75 (0.44 - 1.10)	0.75 (0.50 - 1.25)	0.74 (0.40 - 1.11)	0.69 (0.10 - 1.34)	0.69 (0.41 - 1.14)	0.62 (0.29 - 1.24)	0.60 (0.26 - 1.07)	0.61 (0.22 - 1.31)	0.61 (0.21 - 1.28)	0.67
Total Organic N (calc.) (mg/l)	0.34 (<0.10 - 0.77)	0.24 (<0.10 - 1.00)	0.31 (<0.10 - 1.06)	0.29 (<0.10 - 0.70)	0.30 (0.10 - 0.70)	0.31 (<0.10 - 0.90)	0.38 (0.10 - 0.90)	0.22 (<0.10 - 0.40)	0.50 (0.08 - 1.70)	0.32
Total N (calc.) (mg/l)	1.1 (0.4 - 1.7)	1.0 (0.5 - 1.8)	1.0 (0.4 - 1.9)	1.1 (0.5 - 1.6)	1.0 (0.5 - 1.6)	0.9 (0.5 - 1.6)	1.0 (0.4 - 1.7)	0.8 (0.4 - 1.6)	1.1 (0.4 - 2.0)	1.0
Dissolved Orthophosphate (mg/l)	0.022 (0.007-0.078)	0.020 (0.006-0.047)	0.160 (0.002-0.055)	0.024 (0.004-0.052)	0.019 (0.003-0.038)	0.016 (<0.001-0.052)	0.029 (0.003-0.089)	0.011 (0.001-0.023)	0.018 (0.002-0.034)	0.035
Total Phosphorus (mg/l)	0.037 (0.005-0.700)	0.040 (0.010-0.080)	0.036 (0.004-0.070)	0.065 (0.030-0.080)	0.060 (0.030-0.100)	0.058 (0.020-0.100)	0.049 (0.020-0.080)	0.060 (0.010-0.220)	0.090 (0.010-0.180)	0.055

TABLE 3-11. Means and Ranges of Nutrients at Main River Stations, Middle Black Warrior River, Stations R-10 thru R-16 (Lower Black Warrior River), July 1978 thru October 1979

PARAMETER	R - 10	R - 12	R - 13	R - 14	R - 15	R-16	$\bar{x}$
Ammonia-N (mg/l)	0.11 (0.01 - 0.28)	0.12 (<0.03 - 0.21)	0.14 (0.03 - 0.36)	0.12 (<0.03 - 0.22)	0.36 (<0.03 - 1.70)	0.15 (<0.03 - 0.24)	0.17
Nitrate-Nitrite-N (mg/l)	0.50 (0.20 - 0.87)	0.51 (0.19 - 0.93)	0.53 (0.16 - 1.20)	0.52 (0.24 - 0.89)	0.49 (0.28 - 0.90)	0.50 (0.29 - 0.83)	0.51
Total Kjeldahl-N (mg/l)	0.37 (0.10 - 0.80)	0.51 (0.12 - 1.00)	0.58 (0.20 - 1.10)	0.46 (0.10 - 0.80)	0.52 (0.20 - 1.10)	0.71 (0.10 - 1.70)	0.53
Total Inorganic-N (calc.) (mg/l)	0.59 (0.24 - 0.98)	0.64 (0.22 - 1.10)	0.68 (0.22 - 1.42)	0.65 (0.28 - 1.06)	0.61 (0.31 - 1.11)	0.64 (0.32 - 1.02)	0.64
Total Organic N (calc.) (mg/l)	0.24 (0.08 - 0.71)	0.39 (<0.10 - 0.96)	0.44 (<0.10 - 1.00)	0.42 (<0.10 - 0.80)	0.44 (<0.10 - 1.00)	0.57 (<0.10 - 1.50)	0.42
Total N (calc.) (mg/l)	0.8 (0.4 - 1.5)	1.1 (0.4 - 1.8)	1.[illegible] (0.3 - 1.8)	1.1 (0.4 - 1.7)	1.0 (0.3 - 1.8)	1.2 (0.4 - 2.4)	1.0
Dissolved Orthophosphate (mg/l)	0.016 (0.005-0.034)	0.013 (0.001-0.033)	0.011 (<0.001-0.028)	0.013 (<0.001-0.031)	0.019 (<0.001-0.040)	0.016 (<0.001-0.045)	0.015
Total Phosphorus (mg/l)	0.081 (0.020-0.190)	0.071 (0.010-0.170)	0.149 (0.020-0.650)	0.087 (0.040-0.210)	0.099 (0.040-0.220)	0.067 (0.010-0.180)	0.092

3-12. Means and Ranges of Nutrients at Main River Stations, Middle Tombigbee River, Stations R-17 thru R-21 (Tombigbee River), July 1978 thru October 1979

PARAMETER	R - 17	R - 18	R - 19	R - 20	R - 21	x̄
Ammonia-N (mg/l)	0.15 (<0.03 - 0.40)	0.10 (<0.01 - 0.31)	0.13 (<0.01 - 0.50)	0.09 (<0.01 - 0.22)	0.16 (<0.03 - 0.22)	0.11
Nitrate-Nitrite-N (mg/l)	0.19 (0.07 - 0.55)	0.18 (0.03 - 0.48)	0.18 (<0.01 - 0.53)	0.22 (<0.10 - 0.66)	0.26 (0.02 - 0.60)	0.21
Total Kjeldahl-N (mg/l)	0.79 (0.30 - 1.60)	0.67 (0.20 - 1.10)	0.87 (0.50 - 1.70)	0.73 (0.20 - 1.80)	0.66 (0.20 - 1.30)	0.74
Total Inorganic-N (calc.) (mg/l)	0.29 (0.12 - 0.80)	0.29 (0.01 - 0.79)	0.25 (0.10 - 0.72)	0.25 (0.10 - 0.88)	0.29 (0.05 - 0.64)	0.27
Total Organic N (calc.) (mg/l)	0.70 (0.30 - 1.60)	0.60 (0.20 - 1.00)	0.80 (0.40 - 1.60)	0.65 (0.10 - 1.80)	0.55 (0.10 - 1.30)	0.66
Total N (calc.) (mg/l)	1.0 (0.4 - 1.9)	0.8 (0.4 - 1.2)	1.0 (<0.2 - 1.9)	0.8 (0.1 - 2.1)	0.8 (0.2 - 1.7)	0.9
Dissolved Orthophosphate (mg/l)	0.042 (<0.001-0.114)	0.066 (<0.001-0.272)	0.049 (0.004-0.144)	0.042 (0.003-0.157)	0.030 (<0.001-0.068)	0.046
Total Phosphorus (mg/l)	0.250 (0.060-1.320)	0.250 (0.020-1.300)	0.140 (0.040-0.430)	0.130 (0.030-0.450)	0.120 (0.030-0.210)	0.180

TABLE 3-13. Means and Ranges of Nutrients at Main River Stations, Middle Black Warrior and Tombigbee River, Stations R-22 and R-23 (Demopolis Lake), July 1978 thru October 1979

PARAMETER	R - 22	R - 23	$\bar{x}$
Ammonia-N (mg/l)	0.10 (0.02 - 0.20)	0.12 (0.02 - 0.26)	0.11
Nitrate-Nitrite-N (mg/l)	0.45 (0.19 - 1.08)	0.39 (0.03 - 1.06)	0.42
Total Kjeldahl-N (mg/l)	0.62 (0.10 - 1.60)	0.63 (0.10 - 1.30)	0.63
Total Inorganic-N (calc.) (mg/l)	0.55 (0.27 - 1.28)	0.51 (0.12 - 1.32)	0.53
Total Organic N (calc.) (mg/l)	0.54 (<0.10 - 1.50)	0.39 (<0.10 - 1.20)	0.47
Total N (calc.) (mg/l)	1.0 (0.3 - 2.3)	0.9 (0.3 - 1.8)	1.0
Dissolved Orthophosphate (mg/l)	0.051 (0.002-0.021)	0.023 (<0.001-0.058)	0.037
Total Phosphorus (mg/l)	0.088 (0.010-0.270)	0.131 (0.040-0.270)	0.110

had the highest average ammonia level, 0.36 mg/l (Table 3-11). The lowest average ammonia level, 0.09 mg/l, occurred at R-6 (Table 3-10) and R-20 (Table 3-12). The maximum ammonia concentration observed during the study was 0.36 mg/l at R-13 in February 1979 (Table A-5). The minimum ammonia concentration was non-detectable (<0.01 or <0.03 mg/l depending on month) which was recorded at several Lower Black Warrior River and Tombigbee River stations during July and August 1978 (Tables A-1 and A-2). Considering all stations, the lowest ammonia levels were observed in August 1978 (Table A-2) and the highest in July 1979 (Table A-8).

On the average, the river sections were close in their ammonia concentrations. The Lower Black Warrior River had the highest grand average, 0.13 mg/l (Table 3-11). Warrior Lake, the Tombigbee River and Demopolis Lake averaged 0.11 mg/l (Tables 3-10, 3-12 and 3-13, respectively). These results indicate a seasonal variation for ammonia approaching 3 orders of magnitude with only moderate differences existing in yearly averages between the river sections.

Nitrate-Nitrite. Levels of nitrate-nitrite-nitrogen were as variable by season as ammonia and they had a greater variation by river section. R-4 had the highest average concentration of nitrate-nitrite, 0.67 mg/l (Table 3-10). The lowest average nitrate-nitrite level, 0.18 mg/l, occurred at R-18 and R-19 (Table 3-12). The maximum nitrate-nitrite concentration recorded during the study was 1.20 mg/l at R-13 during June 1979 (Table A-7). The minimum nitrate-nitrite level observed was <0.01 mg/l (R-19 and R-20, Table 3-12). June 1979 (Table A-7), showed the highest monthly nitrate-nitrite values while the lowest occurred in October 1979 (Table A-3).

Warrior Lake had the highest grand average nitrate-nitrite value, 0.58 mg/l (Table 3-10) and the Lower Black Warrior had a slightly smaller average, 0.51 mg/l (Table 3-11). The Tombigbee River had the lowest study period average, 0.21 mg/l (Table 3-12) with Demopolis Lake having an intermediate average, 0.42 mg/l (Table 3-13). Thus, nitrate-nitrite had both large seasonal and river section variations.

Total Kjeldahl Nitrogen. Trends of total Kjeldahl nitrogen (TKN) were different than those exhibited by the othe nitrogenous compounds. The station with the highest average TKN was R-19 with 0.87 mg/l (Table 3-12). R-10 had the lowest average TKN, 0.37 mg/l (Table 3-11). The maximum TKN concentration was 1.80 mg/l, recorded R-20 in February 1979 (Table A-5); the minimum was 0.10 mg/l recorded at several stations in the Black Warrior River during several months (Appendix A). The month with the lowest TKN levels was August 1978 (Table A-2). The highest overall TKN concentrations were observed in May 1979 (Table A-6).

TKN levels were the highest in the Tombigbee River, which had a study period average of 0.74 mg/l (Table 3-12). Demopolis Lake was slightly lower with an average of 0.63 mg/l TKN. Warrior Lake had an average of almost 50% less TKN than the Tombigbee River (0.44 mg/l, Table 3-10), with the Lower Black Warrior River being slightly higher (0.53 mg/l, Table 3-11). These results indicate high levels of TKN, with the sectional distribution being quite different than that of ammonia or nitrate-nitrite-nitrogen.

Total Inorganic Nitrogen (Calculated). Total inorganic nitrogen (TIN) represents the sum of the ammonia nitrogen and nitrate-nitrite nitrogen which is the total available nitrogen for plant growth (U.S. EPA, 1978). Due to the method of calculation, trends for TIN generally followed the trends of the major component, nitrate-nitrite.

The highest average TIN level observed was 0.75 mg/l at R-1 and R-2 (Table 3-10); the lowest was 0.25 mg/l at R-19 and R-20 (Table 3-12). The maximum value calculated for TIN was 1.42 mg/l at R-23 in June 1979 (Table A-7). The minimum TIN during the study period (dismissing the summation of nondetectable components) was 0.01 mg/l at R-20 in August 1978 (Table A-2). TIN levels were generally the lowest during October 1978 (Table A-3) and the highest during June, 1979 (Table A-7).

The river section trends for average TIN values are parallel to those trends for nitrate-nitrite. Warrior Lake had the highest average, 0.67 mg/l (Table 3-10) with the Lower Black Warrior River averaging slightly less, 0.64 mg/l (Table 3-11). The Tombigbee River had a much lower average TIN (0.27 mg/l, Table 3-12) and Demopolis Lake showed an average TIN level between the two rivers, 0.53 mg/l (Table 3-13).

Total Organic Nitrogen (Calculated). Total organic nitrogen (TON) represents the concentration of TKN minus the concentration of ammonia nitrogen. TON, then, is that part of the nitrogen load which is oxidizable and would be a nitrogenous oxygen demand.

The highest average TON level observed during the study was 0.80 mg/l at R-19 (Table 3-12). The lowest average TON was observed at R-8 (0.22 mg/l, Table 3-10). R-20 had the single highest TON level, 1.80 mg/l, recorded in February 1979 (Table A-5). The minimum TON level observed during the study, which was <0.10 mg/l, occurred at several Black Warrior River and Demopolis Lake stations during August 1978 (Table A-2), October 1978 (Table A-3), February 1979 (Table A-5) and June 1979 (Table A-7). Considering all stations during a month, October 1978 (Table A-3) recorded the lowest TON values while May 1979 had the highest values for the Black Warrior River (Table A-6) and February 1979 (Table A-5) had the highest TON levels on the Tombigbee River.

Trends for river sections distirubiton of TON were generally similar to trends set by TKN levels. The Tombigbee River had the highest average TON level, 0.66 mg/l (Table 3-12). Warrior Lake had the lowest average TON level, 0.32 mg/l (Table 3-10) with the Lower Black Warrior River having a 30% higher average TON loading, 0.42 mg/l (Table 3-11). Demopolis Lake had an average TON between the values for the two rivers, 0.47 mg/l (Table R-13). These data indicate a distribution of oxidizable nitrogen which varies extensively by season and river section and closely follows the average concentration of TKN.

Total Nitrogen (Calculated). The levels of total nitrogen (TN) were calculated by summing the TIN and TON calculated values at each station. The highest average TN level observed during the study was 1.2 mg/l at R-16 (Table 3-11). The lowest average TN level observed was 0.8 mg/l which occurred most frequently in the Tombigbee River (Table 3-12). The maximum TN concentration observed during the study, 2.4 mg/l, was recorded at R-16 in May 1979 (Table A-6); the minimum,

0.2 mg/l occurred at several Tombigbee River stations in October 1978 (Table A-3).

Warrior Lake, the Lower Black Warrior River and Demopolis Lake had equal average TN values, 1.0 mg/l (Tables 3-10, 3-11 and 3-13). The Tombigbee River averaged 0.9 mg/l TN (Table 3-12). These results show that, despite seasonal and spatial variations, the two rivers were receiving approximately equal total nitrogen loadings, while the forms varied extensively.

Dissolved Orthophosphate. Concentrations of dissolved orthophosphates (ortho-P) exhibited extreme variations between stations, seasons and river sections. R-3, on Lake Warrior, had the highest average ortho-P level, 0.16 mg/l (Table 3-10). The lowest average ortho-P concentration recorded during the study, 0.011 mg/l, occurred at R-8 (Table 3-10) and R-13 (Table 3-11). The maximum ortho-P concentration observed was 0.272 mg/l (R-18, May 1979, Table A-6); the minimum, <0.001 mg/l, was recorded at stations in all river sections (see Table 3-10 through 3-13), primarily during July and August 1978 (Tables A-1 and A-2, respectively). May 1979 had the overall highest ortho-P values (Table A-6) while July 1978 (Table A-1) had the overall lowest ortho-P concentrations.

The Tombigbee River showed the highest study period average, 0.046 mg/l (Table 3-12). The Upper Black Warrior River had higher average levels of ortho-P than did the lower Black Warrior River, with 0.035 and 0.015 being the respective average levels (Tables 3-10 and 3-11, respectively). Demopolis Lake had an average ortho-P concentration of 0.037 mg/l (Table 3-13), a value falling between the levels of the two rivers. Thus, ortho-P had widely varying concentrations between seasons and river basins.

Total Phosphorus. Total phosphorus concentrations were much higher than ortho-P levels, but showed similar variations. The highest average phosphorus concentration was 0.250 mg/l, observed at R-17 and R-18 (Table 3-12). The lowest average phosphorus level was 0.035 mg/l (R-3, Table 3-10). The maximum concentration of phosphorus observed during the study was 0.650 mg/l recorded at R-13 in June 1979 (Table A-7; note that this is an unusually high value for that month). The minimum observed level for phosphorus was 0.010 mg/l, recorded in the Black Warrior River and Lake Demopolis on several occasions (see Appendix A). Overall the lowest phosphorus levels occurred in July 1979 (Table A-1) and the highest levels were in February 1979 (Table A-5).

The Tombigbee River had the highest average phosphorus levels, 0.180 mg/l (Table 3-12). Warrior Lake was lower in total phosphorus than the Lower Black Warrior River with the average levels being 0.055 mg/l (Table 3-10) and 0.092 mg/l (Table 3-11), respectively. Demopolis Lake averaged somewhat higher than the Black Warrior River, 0.110 mg/l (Table 3-13). The patterns in the distribution of phosphorus between the river basins is similar to that of ortho-P with the average values being up to 100% greater for total phosphorus.

3.1.1.5 Heavy Metals

Summarized in this section are the results of heavy metal analyses performed on water samples on monthly or quarterly bases. Table 3-14

through 3-17 present the summarized data. Raw data for the individual samplings are found in Appendix A.

Dissolved Iron. Trends for concentrations of dissolved iron showed extreme variations between river sections and seasons. The highest average concentration for dissolved iron was 352 µg/l at R-18 (Table 3-16). R-2 had the lowest average dissolved iron, 58 µg/l (Table 3-14). The single highest dissolved iron concentration was 882 µg/l, recorded at R-18 in February 1979 (Table A-5). Because of the variable detection limit for dissolved iron, the lowest concentration is a "less than" value which was recorded for several stations in both sections of the Black Warrior River and in the Tombigbee during several months (see Tables 3-14, 3-15, 3-17 and Appendix A). Generally, the highest values were recorded in February, 1979 (Table A-5) and the lowest were during August 1979 (Table A-9) when most stations showed non-detectable dissolved iron concentrations.

The Tombigbee River had the highest average levels of dissolved iron, 260 µg/l (Table 3-16), Demopolis Lake had the second highest level, an average of 115 µg/l dissolved iron (Table 3-17). Warrior Lake had the lowest average value, 78 µg/l (Table 3-14) with the Lower Black Warrior River averaging slightly higher, 96 µg/l (Table 3-15). Thus, the results for dissolved iron showed both extreme seasonal variation, up to 300%, and a river basin variation of approximately the same magnitude.

Total Iron. The concentrations of total iron showed the same general trend of seasonal and spatial variation as dissolved iron. Station R-19 had the highest average concentration of total iron, 3.77 mg/l (Table 3-16). The lowest average concentration was 0.45 mg/l, recorded at R-1 (Table 3-14). The single highest total iron level was 18.40 mg/l, observed at R-19 in February 1979 (Table A-5); the lowest was at R-1 (0.18 mg/l, August 1978, Table A-2). Generally, the highest total iron levels were observed in February 1979 (Table A-5). While August 1979 (Table A-9) may show the lowest overall values for total iron, it should be noted that this "base level" appeared (with about 25% variation) on several occasions.

The Tombigbee River, with a grand average of 3.37 mg/l (Table 3-16), had the greatest constant concentrations of total iron. Warrior Lake had the lowest average levels of total iron, 0.87 mg/l (Table 3-14). The Lower Black Warrior River had a slight increase in average total iron concentration with 1.39 mg/l being the average for the study period (Table 3-15). Demopolis Lake had a value intermediate of the two rivers, 1.80 mg/l (Table 3-17). The results for total iron indicate that iron distributions in study area (both total and dissolved iron) have drastic seasonal fluctuations, with the Tombigbee River carrying a consistently higher iron loading than the Black Warrior River.

Dissolved Manganese. Concentrations of dissolved manganese showed markedly different trends from the trends of iron in the study area. R-1 had the highest average levels of dissolved manganese, 128 µg/l, (Table 3-14). The lowest average level of dissolved manganese, 22 µg/l, occurred at R-21 (Table 3-16). The maximum single concentration of dissolved manganese, 419 mg/l, occurred at R-10 in February 1979 (Table A-5). The minimum value, non-detectable (with a variable lower limit),

TABLE 3-14. Means and Ranges of Heavy Metals at Main River Stations, Middle Black Warrior River Stations R-1 thru R-9 (Warrior Lake), July 1978 thru October 1979

PARAMETER	R - 1	R - 2	R - 3	R - 4	R - 5	R - 6	R - 7	R - 8	R - 9	$\bar{x}$
Iron Dissolved (μg/l)	63 (34 - 176)	58 (<28 - 90)	62 (<16 - 146)	64 (<25 - 165)	78 (<50 - 193)	87 (<24 - 185)	115 (<50 - 250)	83 (<12 - 219)	88 (<13 - 219)	78
Iron Total (mg/l)	0.45 (0.18 - 0.84)	0.59 (0.24 - 1.59)	0.82 (0.37 - 1.74)	1.49 (0.35 - 8.02)	0.90 (0.28 - 1.55)	0.94 (0.3[illegible] - 2.33)	0.89 (0.28 - 1.70)	0.97 (0.33 - 2.35)	0.78 (0.26 - 2.42)	0.87
Manganese Dissolved (μg/l)	128 (<8 - 307)	115 (<8 - 371)	119 (<4 - 340)	114 (<4 - 360)	101 (<4 - 392)	94 (<4 - 280)	77 (<4 - 240)	94 (<9 - 320)	81 (<2 - 280)	103
Manganese Total (μg/l)	160 (10 - 380)	177 (20 - 310)	186 (40 - 420)	192 (70 - 420)	209 (40 - 560)	140 (<50 - 320)	110 (10 - 330)	179 (<50 - 350)	141 (40 - 330)	166
Zinc Total (μg/l)	53 (<10 - 160)	120 (<10 - 540)	109 (<10 - 750)	151 (<10 - 896)	73 (<10 - 240)	90 (<10 - 465)	46 (<10 - 110)	58 (<10 - 242)	47 (<10 - 116)	33

TABLE 3-15. Means and Ranges of Heavy Metals at Main River Stations, Middle Black Warrior River Stations R-10 thru R-16 (Lower Black Warrior River), July 1978 thru October 1979

PARAMETER	R - 10	R - 12	R - 13	R - 14	R - 15	R - 16	$\bar{x}$
Iron Dissolved (μg/l)	80 (<28 - 200)	126 (<11 - 420)	91 (<50 - 130)	87 (5 - 180)	91 (<50 - 303)	98 (<20 - 213)	96
Iron Total (mg/l)	1.73 (0.30 - 10.10)	1.14 (0.24 - 5.69)	1.53 (0.31 - 9.51)	1.43 (0.33 - 8.78)	1.19 (0.28 - 6.42)	1.34 (0.41 - 8.33)	1.39
Manganese Dissolved (μg/l)	100 (<2 - 419)	85 (<2 - 307)	87 (<4 - 37)	89 (<4 - 371)	73 (<50 - 371)	69 (<4 - 339)	84
Manganese Total (μg/l)	157 (50 - 460)	128 (50 - 250)	119 (<50 - 400)	148 (<50 - 720)	162 (40 - 510)	130 (20 - 480)	141
Zinc Total (μg/l)	76 (<10 - 300)	178 (<10 - 827)	76 (<10 - 360)	65 (<10 - 280)	61 (<10 - 370)	76 (<10 - 360)	89

TABLE 3-16. Means and Ranges of Heavy Metals at Main River Stations, Middle Tombigbee River Stations R-17 thru R-21 (Tombigbee River), July 1978 thru October 1979

PARAMETER	R - 17	R - 18	R - 19	R - 20	R - 21	
Iron Dissolved (μg/l)	283 (<25 - 640)	352 (11 - 882)	231 (<28 - 485)	223 (30 - 510)	214 (50 - 460)	260
Iron Total (mg/l)	3.22 (0.31 - 16.32)	3.30 (0.25 - 15.32)	3.77 (0.22 - 18.04)	3.36 (0.24 - 16.59)	3.21 (0.42 - 11-14)	3.37
Manganese Dissolved (μg/l)	33 (<4 - 90)	28 (<4 - 50)	23 (<2 - 13)	25 (<2 - 50)	22 (<2 - 11)	26
Manganese Total (μg/l)	118 (50 - 260	117 (30 - 410)	101 (<10 - 360)	121 (20 - 430)	84 (40 - 290)	108
Zinc Total (μg/l)	94 (<10 - 620)	58 (<10 - 190)	40 (<10 - 170)	111 (<10 - 640)	77 (<10 - 320)	76

TABLE 3-17. Means and Ranges of Heavy Metals at Main River Stations, Middle Black Warrior and Tombigbee Rivers, Stations R-22 and R-23 (Dempolis Lake), July 1978 thru October 1979

PARAMETER	R - 22	R - 23	$\bar{x}$
Iron Dissolved (μg/l)	116 (26 - 310)	113 (8 - 357)	115
Iron Total (mg/l)	1.70 (0.45 - 9.60)	1.94 (0.31 - 10.32)	1.80
Manganese Dissolved (μg/l)	48 (<4 - 179)	36 (<4 - 179)	42
Manganese Total (μg/l)	111 (<50 - 250)	104 (40 - 800)	108
Zinc Total (μg/l)	104 (<10 - 678)	63 (<10 - 240)	84

was recorded at every station at least twice, most notably in June and July 1979 (Tables A-7 and A-8, respectively) when all stations showed <50 μg/l. Overall, the highest values were recorded in February 1979 (Table A-5) and, as noted, the lowest in the summer of 1979.

Warrior Lake had the highest average dissolved manganese level 103 μg/l (Table 3-14). The Lower Black Warrior River had an average slightly less than the upper section, 84 μg/l (Table 3-15). The Tombigbee River had the minimum average, 26 μg/l (Table 3-16). Demopolis Lake, with a study period average of 42 μg/l dissolved manganese, fell between the two river levels. Thus, the Black Warrior River carried higher dissolved manganese loadings which showed extreme seasonal variations, and the Tombigbee River was much lower, both in loading and in variation.

Total Manganese. Total manganese concentrations were much more similar between the river sections than was dissolved manganese. The highest average total manganese level was 209 μg/l at R-5 (Table 3-14). The lowest average total manganese was 84 μg/l at R-21 (Table 3-16). The maximum total manganese level observed during the study was 720 μg/l at R-14 in February 1979 (Table A-5). The lowest total manganese concentrations observed was <10 μg/l at R-19 in August 1978 (Table A-2). Several other instances of "less than" levels were observed, but conditions during this month allowed for detection of the minimum concentrations. Overall, the lowest total manganese concentrations apparently in July 1979 and August 1979 (Tables A-8 and A-9, respectively). The maximum levels of total manganese occurred in the whole study area during February 1979 (Table A-5).

As with dissolved manganese, Warrior Lake, with 166 μg/l (Table 3-14), had the highest average total manganese levels. The Lower Black Warrior River showed a slightly lower average 141 μg/l (Table 3-15). The Tombigbee River had very much lower average total manganese levels than the Black Warrior River with the grand average being 108 μg/l (Table 3-16). Demopolis Lake had the same average, 108 μg/l (Table 3-17). Thus, total manganese had much closer average values between the river sections, while seasonal fluctuations were just as great as for dissolved manganese.

Total Zinc. Total zinc levels in the Middle Black Warrior-Tombigbee Rivers showed little variations between the river basins. However, seasonal fluctuations were as great as 1000%. The highest average level of zinc was 178 μg/l, recorded at R-12 (Table 3-15). R-19 had the lowest average zinc concentration, 40 μg/l (Table 3-16). The maximum zinc level, 896 μg/l, was recorded at R-4 in October 1978 (Table A-3). The minimum value observed during the study, <10 μg/l was recorded at every station at least once. The overall lowest zinc levels were observed during June 1979 (Table A-7) and August 1979 (Table A-9) when approximately 75% of the stations had <10 μg/l zinc. October 1978 had the overall highest concentrations of zinc (Table A-5).

The range between river sections for average zinc concentrations was very small, 13 μg/l. Warrior Lake averaged 83 μg/l (Table 3-14), the Lower Black Warrior River averaged slightly greater, 89 μg/l zinc, which was the highest average for a river section (Table 3-15). The Tombigbee River had the lowest average zinc concentration, 76 μg/l

(Table 3-16). Demopolis Lake had an average of 84 μg/l zinc for the study period. Zinc concentrations were much more consistent, on the average, between the river sections than any other heavy metal studied. However, zinc did display extreme seasonal variations.

Table 3-18 presents a summary of these analyses as performed on the samples from the Middle Black Warrior and Tombigbee Rivers. Precision data showed very good reproductibility for titration analyses (e.g., chlorides with an average range of 0.35 mg/l), automated analyses with the Technicon Autoanalyzer (e.g. TKN with a range and standard deviation of 0.2 mg/l) and manual analyses such a turbidity. The atomic absorption (AA) analyses (e.g. total and dissolved iron, zinc) showed much higher ranges, however, average accuracies were very good for these same parameters. This is not an unusual occurrence for AA analyses at the low-levels which occurred during this study. Accuracy data also showed that the automated analyses (i.e. nitrogen series on the Technicon) and instrument analyses such as carbon analyses, had a very good record of performance for the study.

The QC analyses performed during this study, gave the data an overall more valid stance since it allowed for rapid assessment of the validity of the data being produced. Although not shown on Table 3-18, several series of analyses were rejected as being "out of control" and were repeated. Most notably, this happened on a few occasions with total non-filterable residue and dissolved organic carbon. In July 1979 TKN analyses were repeated four times trying to bring them "in-control" according to the Shewhart charts. Finally, before reproducible results were obtained, samples had exceeded their holding time and were not reported. Thus, the QC procedures utilized for this project allowed for reporting only data which met statistical validity for the analyzing laboratory.

3.1.2 Sediment Analyses

3.1.2.1 Grain Size Analysis

Two sediment grain size analyses were performed during this study as shown in Table 1-6. The results of these analyses are presented in tabular form in Appendix H and are summarized in Table 3-19. Appendix I contains a graphic presentation of the grain size distribution at each station (Table 3-18).

The results of the two annual analyses indicate that some sections experienced a shift in sediment grain size distribution (see 3.1.1.1 for a description of the river sections within the study area). Warrior Lake stations had a shift in average composition which represented a redistribution of sands and the addition of some clay materials. However, these changes were not severe enough to change the general sediment classification for the section, although several stations did have a reduced gravel content (see Tables H-1 and H-2). A similar redistribution of the sand and fine content shifted the general classification of the Lower Black Warrior River in 1979 from loamy sand to sandy loam (Table 3-19). Thus, the Black Warrior River experienced only minor changes in the grain size distribution. In contrast, the Tombigbee River and Demopolis Lake in particular, experienced much larger shifts in sediment composition.

Table 3-18. Summary of Quality Control Data for Selected Parameters, Middle Black Warrior and Tombigbee Rivers, July 1978 through October 1979.

PARAMETER	Precision[1]			Accuracy[1]		
	n	$\bar{x}$	s	n	$\bar{x}$	s
Alkalinity	43	1.43	2.96	NOT REQUIRED		
Dissolved Organic Carbon	33	1.46	2.20	23	105	13
Total Organic Carbon	36	1.18	1.45	27	98	9
Chlorophyll a	28	1.36	1.93	NOT REQUIRED		
Color, True	41	1.05	1.76	NOT REQUIRED		
Fecal Coliform	41	36.9	121.9	NOT REQUIRED		
Fecal Streptococci	41	28.4	41.29	NOT REQUIRED		
Tot. Filt. Residue	41	12.32	14.90	NOT REQUIRED		
Tot. Nonfilt. Residue	41	4.38	5.14	NOT REQUIRED		
Turbidity	44	1.16	1.93	NOT REQUIRED		
Calcium, Total	13	0.77	0.52	NOT REQUIRED		
Chlorides	17	0.35	0.61	NOT REQUIRED		
Dissolved Iron	43	31.49	35.18	14	116	34
Total Iron	44	0.97	4.64	45	106	15
Total Magnesium	13	0.20	0.30	13	93	5
Dissolved Manganese	41	19.72	68.45	15	96	24
Total Manganese	36	0.04	0.05	39	106	24
Ammonia-N	42	0.02	0.02	36	103	5
Nitrate-Nitrite-N	42	0.04	1.75	34	100	5
Total Kjeldahl-N	37	0.17	0.18	24	110	21
Dissolved Orthophosphates	41	0.01	0.01	34	95	8
Total Phosphorus	41	0.01	0.01	30	104	14
Total Potassium	13	0.07	0.06	13	96	7
Total Sodium	13	0.71	0.99	13	97	7
Dissolved Sulfates	38	0.84	1.15	27	98	9
Sulfides (Total S)	41	0.15	0.50	2	104	2
Zinc	39	106.9	334.7	20	102	9

[1]Precision is represented by the mean of the range of duplicate analyses; accuracy by the mean percent recovery of a known addition.

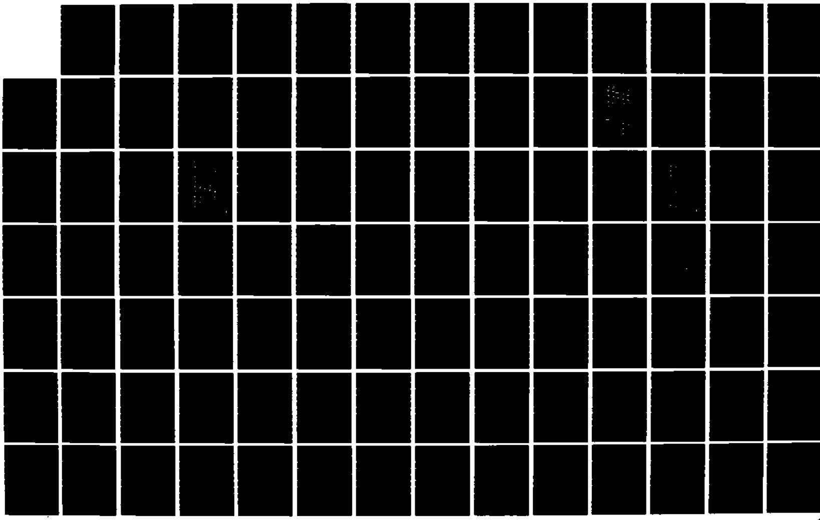
Table 3-19 Summary of Average Grain Size Distributions of Sediment, Middle Black Warrior and Tombigbee Rivers, August 1978 and August 1979

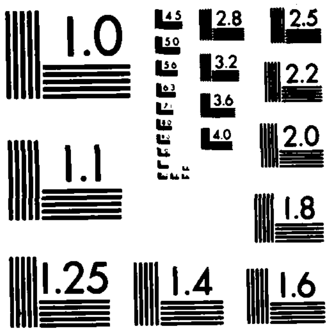
SECTION	DATE	% GRAVEL	SAND %Coarse	SAND %Med	SAND %Fine	FINES % Silt & Clay	Classification (after USDA, 1951)
Warrior	1978	6	1	15	50	28	Sandy loam
Lake	1979	5	5	26	34	23/7*	Sandy loam
Lower Black Warrior	1978	3	1	8	68	20	Loamy sand
River	1979	7	2	20	51	16/4	Sandy loam
Tombigbee	1978	4	1	17	60	21	Sandy loam
River	1978	16	3	10	43	17/11	Gravelly sandy clay loam
Demopolis	1978	1	1	1	43	42/12	Loam
Lake	1979	4	3	5	36	26/26	Clay loam

%Silt/%Clay; single numbers are % Silt.

AD-A131 693 WATER QUALITY MANAGEMENT STUDIES MIDDLE BLACK WARRIOR AND LOWER TOMBIGBEE..(U) HARMON ENGINEERING AND TESTING CO INC AUBURN AL APR 83 DACW01-78-C-0181 2/6

UNCLASSIFIED F/G 13/2 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

The Tombigbee River in 1978 had the general classification of sandy loam (Table 3-19). By the 1979 sampling this had changed to gravelly sandy clay loam. This change was chiefly caused by the increased measurement of gravels at R-17 (Table H-2) and an increase in the total clay content at R-19, R-20 and R-21 (Table H-2). No clays were present in the 1978 sample (Table H-1). Demopolis Lake also experienced this tremendous increase in clay materials, rising from an average of 14% clay in 1978 (Table H-1) to 27% in 1979 (Table H-2). The increase at R-22 was the largest, going from no clays in 1978 to 36% clay in 1978 while R-23 evidenced a small decline (Table H-1 and H-2). The Tombigbee River had a larger sediment deposit in the lower reaches, including Demopolis Lake, in 1979 than in 1978. This was accompanied by a percentage increase in gravel for stations on the Tombigbee River. In comparison, the Black Warrior River sediment composition remained relatively unchanged over the study period.

3.1.2.2 Physical-Chemical Analyses

At the time of the yearly sediment samplings (Table 1-5), several physical-chemical tests were performed (Table 1-6). These analyses included volatile solids, nutrients, heavy metals and pesticides. Tabular presentations of the results are found in Appendix J.

Miscellaneous Parameters

Volatile Solids. Levels of volatile solids in sediments remained relatively unchanged between 1978 and 1979 at most Black Warrior River stations, while the Tombigbee River showed a general decrease in volatile solids levels and Demopolis Lake remained essentially the same. The highest level for volatile solids in Warrior Lake was 30,000 mg/kg in 1978 (R-8, Table J-1) and 34,000 mg/kg in 1979 (R-1, Table J-3). The Lower Black Warrior River had approximately one-half the volatile solids level as the upper sections, but showed a high of 31,000 mg/kg (R-16, Table J-1) and a 1979 high of 22,000 mg/kg (R-24, Table J-3). These high levels are typical of the river section, and the general observation of the upper river having half the volatile solids levels of the lower river holds true (see Tables J-1 and J-3).

The Tombigbee River had the overall highest volatile solids levels in 1978, ranging from 10,000 mg/kg at R-17 to 63,200 at R-20 with a steady increase between those stations (Table J-1). This trend was not present in 1979, however, as volatile solids levels fluctuated between 9,800 mg/kg and 41,000 mg/kg (Table J-3). Demopolis Lake was relatively stable during the one year study period, maintaining a similar average value (approximately 40,000 mg/kg, although the stations in which showed the maximum levels reversed (Table J-1 and J-3). Overall, the levels of sediment-associated volatile solids fluctuated with river section.

Oil and Grease. The sediment levels of oil and grease did not exhibit any trends or patterns according to river sections or seasonal change in levels. One consistent observation is that the highest sediment-associated levels of oil and grease were recorded at R-1 during both years (216 mg/kg in 1978, Table J-1; and 135 mg/kg in

1979, Table J-3). During both years the Tombigbee River showed values about 30% lower on the average than the Black Warrior River (see Table J-1 and J-3). R-21, which was not sampled in 1978, was an exception in 1979 when it rose more than 50% over the nearest Tombigbee River station (R-20, 47 mg/kg) to 106 mg/kg (Table J-3). Demopolis Lake oil and grease values rose sharply in August 1979 over the 1978 values, which had a 1978 value of 13 mg/kg, was 52 mg/kg in 1979 (Table J-1 and J-3, respectively). The <1 mg/kg oil and grease level at R-23 in 1978 (Table J-1) had been replaced by 51 mg/kg in 1979 (Table J-3). Therefore, although the general trend at about 60% of the stations in the study area was increased levels of oil and grease in 1979, remaining stations showed decreases or stable levels.

Total Organic Carbon. As with volatile solids, total organic carbon (TOC) showed varying patterns over the study period, with a general trend towards decreased levels in 1979. The highest value recorded in 1978 was 38.4 g/kg at R-1 (Table J-1). The high in 1979, 27.3 g/kg was also recorded at R-1 (Table J-3). The remaining stations in Warrior Lake were much lower than R-1 during both years, although 1978 values were consistently higher (Tables J-1 and J-3). The Lower Black Warrior River had approximately equal TOC levels as the majority of stations in Warrior Lake during each sampling with approximate averages being 8 g/kg in 1978 and 3.5 g/kg in 1979, again showing a decrease in 1979.

The Tombigbee River varied slightly from this trend by having overall lower values in 1978 than in 1979. The highest Tombigbee River values were 12.5 g/kg in 1978 (Table J-1) at R-19 and 11.0 g/kg at R-20 in 1979 (Table J-3). However, the other Tombigbee River stations were higher in 1979 by 0.7 to 7 times (Tables J-1 and J-3). Demopolis Lake had values about 50% lower during 1979 than during 1978 (Table J-1 and J-3).

Nutrients

Total Kjeldahl Nitrogen. Levels of total Kjeldahl nitrogen (TKN) in sediments were relatively evenly distributed over the entire study area. An extreme change in magnitude was observed over the study period with levels increasing up to 500% in 1979 over the 1978 levels. The average level in Warrior Lake stations in 1978 was approximately 100 mg/kg (Table J-1) while it was near 300 mg/kg in 1979 (Table J-3). The Lower Black Warrior River TKN levels dropped off about 50% from those in Warrior Lake during each year. The Tombigbee River showed a downstream increase in 1978 (Table J-1). In 1979 this trend occurred again, but was not as consistent as in 1978. One consistent observation was that R-20 had the highest TKN during each sampling: 295 mg/kg in 1978 (Table J-1) and 686 mg/kg in 1979 (Table J-3). Demopolis Lake had relatively low concentrations in 1978 (41 mg/kg at R-22, 39 mg/kg at R-23, Table J-1), comparable to the Lower Black Warrior River levels. In 1979, these levels had dramatically increased to 662 mg/kg at R-22 and 413 mg/kg at R-23 (Table J-3). Thus, while distribution patterns were fairly stable over the study period, the levels increased dramatically in 1979, especially the accumulation noted in Demopolis Lake.

Total Phosphorus. For Warrior Lake, levels of phosphorus were noticeably reduced during 1979 compared to 1978 levels, being about 20% lower overall. There was no large variation between the river sections during any one year except that the Tombigbee River showed higher values than other sections in 1979. The Black Warrior River showed relatively stable levels of sediment-associated total phosphorus during each year. The average value for the river was approximately 250 mg/kg in 1978 and 200 mg/kg in 1979. The Tombigbee River was not as stable. Total phosphorus levels in the upper reaches of the river in the study area were relatively low during each sampling (comparable to Black Warrior River levels) but at R-19 or R-20 (depending on the year) the values increased tremendously. For example, in 1978 R-18 was 273 mg/kg and R-19 was 504 mg/kg (Table J-1). In 1979, R-19 was 291 mg/kg and R-20 was 467 mg/kg (Table J-3). These elevated levels were present downstream in the Tombigbee River and Demopolis Lake. The highest value in the 1978 sampling was 673 mg/kg at R-23; in 1979 it was 502 mg/kg at R-22 (Tables J-1 and J-3 respectively). Thus, the only consistent observation during the study was the high level of sediment-associated phosphorus occurring in Demopolis Lake. All other stations and river sections showed fluctuations in sediment-associated total phosphorus, with the general decrease in concentration in 1979.

Heavy Metals

Copper. Sediment-associated copper levels showed definite changes both in concentration levels between samplings and concentration levels in the river sections. The Black Warrior River had relatively low levels of copper in the sediment during the 1978 sampling. The highest values in Warrior Lake during this trip occurred at stations R-5, R-7 and R-8. R-8 had the highest value for the section at 4.64 mg/kg. Immediately downstream from Warrior Lock and Dam, in the Lower Black Warrior River, values in 1978 were below 1 mg/kg and rose steadily to the highest value for that section at R-16, 6.22 mg/kg. Copper levels were lower on the Tombigbee River than in the Black Warrior River, being very low in the upper reaches and increasing to 3.4 mg/kg by Demopolis Lake. These same trends of high and low values occurred during 1979, except that concentrations were higher. For example, the high at R-8 in 1979 was 8.3 mg/kg (Table J-3) and 10 mg/kg was the highest single level of sediment-associated copper observed (R-6, Table J-3). The trend of lower values below Warrior Lock and Dam and in the Tombigbee River also occurred in 1979. Demopolis Lake showed the same high levels, compared to the other sections, in 1979 with 9.4 mg/kg at R-22 being the highest for the section.

Thus, concentrations of sediment-associated copper varied widely between river sections and years. Overall, concentrations in 1979 were much higher, up to 500%, than the 1978 samples.

Iron. Sediment-associated iron occurs primarily as a mineral constituent in the sediment materials. Warrior Lake had relatively high iron values during both samplings, with the 1979 values being about 50% greater than the 1978 values (Tables J-1 and J-3). The maximum iron level in the Warrior Lake section was observed at R-8 in both years with mg/kg in 1978 (Table J-1) and 20,000 mg/kg in 1979

(Table J-3). Below Warrior Lock and Dam (R-10 and R-12) concentrations were generally lower than those above the dam, but by R-16 had returned to levels comparable with the upstream stations. Sediment associated iron in the Tombigbee River was approximately at the same concentrations as Warrior Lake (see Tables J-1 and J-3). The 1979 values for iron in the lower reaches of the Tombigbee River and in Demopolis Lake were much higher than the 1978 levels in the same river sections. This was especially the case at R-22 which rose from 1100 mg/kg in 1978 (Table J-1) to 21,000 mg/kg in 1979 (Table J-3).

These results indicate a relatively stable level of sediment-associated iron in the Middle Black Warrior and Tombigbee Rivers during a single sampling. The only marked change between the 1978 and 1979 samplings was the rise in the lower reaches of the Tombigbee River and Demopolis Lake, with a general marked rise overall noted for 1979.

Lead. Sediment-associated lead appeared to have stable distributions during the study period. While some stations showed definite increases in lead levels during the 1979 samplings over 1978 levels, overall the levels remained low and relatively unvarying. Warrior Lake had consistent lead levels both years with the section average being approximately 10 mg/kg each year. The Lower Black Warrior River evidenced a distinct drop in lead levels below Warrior Lock Dam during both years (see R-10 and R-12 values, Tables J-1 and J-3). R-14 and R-16 had especially high values, 13.5 mg/kg and 15.8 mg/kg, respectively, in the 1978 sampling (Table J-1) which were not present in the 1979 results (Table J-3). The Tombigbee River sediment-associated lead levels were generally lower than the Black Warrior River lead levels in 1978 (Table J-1). In 1979 the Tombigbee River showed some marked increases bringing Tombigbee River lead levels close to those in the Black Warrior River sediments. R-17 had 20 mg/kg lead (versus 3.0 mg/kg lead in 1978). R-20 and R-21 in the lower reaches of the Tombigbee River also had elevated lead levels, 10 mg/kg and 12 mg/kg, respectively (Table J-3). Demopolis Lake did not show this increase in 1979. The average for lead at R-22 and R-23 was essentially the same during both years, 12 mg/kg. Thus, lead is a relatively stable sediment constituent with a sporadic variation between sampling years.

Manganese. Trends for manganese varied between the river sections, but in 1979 did show a general decreasing trend at most stations. Except for R-1 and R-2, Warrior Lake had relatively high values in 1978, averaging about 600 mg/kg manganese. This section had approximately the same average in 1979, although the concentrations were more unevenly distributed. For example, 1978 manganese values at R-3 and R-4 (637 mg/kg and 570 mg/kg, respectively, Table J-1) had shifted to lower values in 1979 (Table J-3) with a concomitant rise in manganese levels (to a river section maximum of 760 mg/kg at R-6; Table J-3) at R-5 and R-6. The Lower Black Warrior River exhibited similar trends between samplings. The lower stations in this section (R-14 through R-16) decreased in manganese while the stations immediately below Warrior Lock and Dam gained manganese (e.g. R-12 rose from 139 mg/kg in 1978 to 270 mg/kg in 1979, see Table J-1 and J-3). The maximum change in this section occurred at R-14 which decreased from the overall highest value for 1978, 862 mg/kg (Table J-1), to 310 mg/kg in 1979 (Table J-3). The Tombigbee River showed a tremendous accumulation of manganese at R-17, from 76 mg/kg in 1978 (Table J-1) to 320 mg/kg in 1979 (Table J-3). Overall, the Tombigbee River in 1979 had a slight decrease in sediment manganese

levels from the 1978 levels. Demopolis Lake showed an overall accumulation of manganese in 1979 rising from an average (for R-22 and R-23) of 328 mg/kg in 1978 (Table J-1) to 590 mg/kg in 1979 (Table J-3). Thus, while the Black Warrior River and the Tombigbee River showed, with the exception noted above, an overall decrease in sediment-associated manganese levels from 1978 to 1979, Demopolis Lake had a nearly 100% increase in manganese levels.

Mercury. Sediment-associated mercury levels showed marked decrease between 1978 and 1979 samples. The lowest value in 1978 was 0.01 mg/kg (R-10, Table J-1) and the highest was 0.26 mg/kg (R-12, Table (R-12, Table J-3). In comparison, the lowest value recorded in 1979 was 0.02 mg/kg (at several stations including R-12; see Table J-1), while the highest was only 0.11 mg/kg (R-18, Table J-3). Warrior Lake had relatively high values in 1978 at R-2 through R-6 (Table J-1), but in 1979 all Warrior Lake stations had decreased to 0.1 mg/kg or less, except R-8. R-8 showed a 150% increase in 1979, changing from 0.04 mg/kg in 1978 (Table J-1) to 0.10 mg/kg in 1979 (Table J-3). Most stations in the Lower Black Warrior River showed a decrease during the study period, as did all Tombigbee River (Table J-3). The sediment-associated mercury levels in Demopolis Lake rose in 1979 from an average of 0.02 mg/kg in 1978 to 0.07 mg/kg in 1979 (Tables J-1 and J-3, respectively). Demopolis Lake was the only river section to show an overall accumulation of sediment-associated mercury during 1979 as compared to the 1978 levels. Most stations showed a marked decrease in 1979, especially the Lower Black Warrior and Tombigbee Rivers.

Cadmium. Levels of sediment-associated cadmium showed a tremendous increase between 1978 and 1979 samplings. The increase was near 1000% on the average and occurred in all river sections. The highest 1978 value was 0.14 mg/kg reported at R-20 (Table J-1); in 1979 the highest reported value came from R-3 and was 2.0 mg/kg. The minimum value in 1978 was 0.01 mg/kg and occurred at R-3 and R-4 (Table J-1); in 1979 the minimum was 0.37 mg/kg at R-10 (Table J-3). Although all sections exhibited these increases, Demopolis Lake had the greatest increase, rising from an average of 0.075 mg/kg in 1978 to 1.0 mg/kg in 1979 (see Tables J-1 and J-3). Thus, all river sections, and virtually all stations, experienced a ten-fold increase in sediment associated cadmium levels during the study period. It should be noted that due to the drastic nature of these increases, all laboratory procedures and calculations were double checked and found to be correct. Additionally, precision and accuracy data show the analyses to be in-control during each sampling and analysis period.

Nickel. Sediment-associated nickel levels remained unchanged or showed slightly reduced levels at most stations between the 1978 and 1979 samplings, although at least one station in each section showed markedly increased nickel concentrations. Warrior Lake showed increased 1979 levels for nickel at R-1 and R-2 (Table J-3). The average for those two stations in 1978 was approximately 4.5 mg/kg (Table J-1) and was 8.7 mg/kg in 1979 (Table J-3). R-8 showed the highest values in Warrior Lake during both years, with 12.8 mg/kg in 1978 (Table J-1) and 13.0 mg/kg in 1979 (Table J-3). All other stations in Warrior Lake remained approximately equal or showed a slight decline over the study period. In the Lower Black Warrior River, R-12 showed a nearly 100% increase, from 2.5 mg/kg in 1978 (Table J-1) to 4.6 mg/kg in 1979 (Table J-3). The stations in the middle of the section exhibited a decline of at

least 30%. Tombigbee River stations (except R-17 and R-20) exhibited an overall decrease in sediment-associated nickel values (Table J-3). Nickel levels at R-17 increased from the 1978 level of 1.3 mg/kg (Table J-1) to only 13 mg/kg (Table J-3). R-22 in Demopolis Lake showed a marked increase. The 1978 value was 10.5 mg/kg (Table J-1), and the 1979 level was 17 mg/kg (Table J-3). Thus, although most stations evidenced a general decline in levels of sediment-associated nickel, one station in each section indicated an accumulation of nickel.

Zinc. Levels of sediment-associated zinc showed no consistent trend of increase or decrease in most river sections. In Warrior Lake, R-8 had the highest zinc concentrations both years, with 44 mg/kg in 1978 (Table J-1) and 55 mg/kg in 1979 (Table J-3), with the exception of R-2 and R-6 (see Table J-1 and J-3), all other stations maintained near constant concentrations or slightly declined. All stations in the Lower Black Warrior River, except R-12, indicated decreased sediment-associated zinc levels from 1978 to 1979. During both years the lowest zinc concentrations were found at R-12, immediately below Warrior Lock and Dam, and concentrations steadily rose to reach a high for the section at R-16 (see Tables J-1 and J-3). Values for zinc in the Tombigbee River varied only slightly during the study period at all stations except R-17. At this station the 1978 value was only 4 mg/kg (Table J-1), but it increased to 23 mg/kg in 1979 (Table J-3). A similar rise was seen at R-22 in Demopolis Lake which was 37 mg/kg in 1978 (Table J-1) and 63 mg/kg in 1979 (Table J-3), the highest zinc level observed in 1979. The results indicate only minor changes in zinc sediment concentration over the entire study area during the one year period of observation.

Arsenic. Arsenic showed a pattern of increases similar to that of cadmium, with the average being a five- to ten-fold increase between 1978 and 1979. Warrior Lake showed the greatest consistent increases from 1978 to 1979. The 1978 high for sediment-associated arsenic in this section was 0.82 mg/kg at R-8 (Table J-1); the 1979 high was 8.7 mg/kg at R-9 (Table J-3). This level of increase is typical for the section. The Lower Black Warrior River generally had smaller arsenic levels with 0.80 mg/kg as the high in 1978 (Table J-1) and 7.2 mg/kg (Table J-3) in 1979. The magnitude of increase from 1978 to 1979 was approximately the same as in Warrior Lake but the overall 1979 levels were lower (Table J-3). The Tombigbee River showed the overall lowest levels of sediment-associated arsenic in both samplings. Also, during both 1978 and 1979 arsenic showed a steady downstream increase. In 1978, R-17 in the upper reaches of the Tombigbee River had 0.14 mg/kg arsenic (Table J-1) and in 1979 this station had 2.6 mg/kg (Table J-3). This level rose to 0.74 mg/kg in 1978 and 10.2 mg/kg in 1979 at the lower reach of the river (Table J-1 and J-3, respectively). Also, the 1979 high level for sediment-associated arsenic was 10.2 mg/kg. Demopolis Lake also showed the ten-fold accumulation of arsenic having a 1978 average of 0.76 mg/kg (Table J-1) and a 1979 average of 8.5 mg/kg. This 1100% increase was the greatest for any river section. Thus, levels of sediment-associated arsenic showed increases in the one-year study period averaging about ten-fold. This increase was very similar to the increases exhibited by sediment-associated cadmium.

Chromium. Levels of sediment-associated chromium showed general increases during the study period of approximately 100%. During both studies the highest levels of the chromium were found in Demopolis Lake.

The 1978 high was 17.9 mg/kg at R-22 (Table J-1), and the 1979 high also occurred at R-22 and was 34 mg/kg (Table J-3). Warrior Lake had moderate values during 1978, averaging about 5 mg/kg (Table J-1) chromium. These levels were increased in 1979 with the average being approximately 11 mg/kg (Table J-3). R-12, immediately below Warrior Lock and Dam, had the lowest chromium measurements on the Black Warrior River each year. However, the remainder of this section had chromium levels higher than or near the median, as compared to all stations. This was true for the Lower Black Warrior River during both 1978 and 1979 samplings. The Tombigbee River had higher levels than the Black Warrior during both years (Tables J-1 and J-3) with high levels occurring at R-20 and R-21 during 1979 (26 mg/kg and 29 mg/kg, Tables J-1 and J-3, respectively). These results indicate that during the one year study period chromium levels in sediment underwent an approximately doubling in concentration within each river section.

Pesticides

The sediment samples obtained during the 1978 sampling were subjected to a screening and quantification analysis for 15 common chlorinated hydrocarbons and 3 PCB compounds. In these tests only seven compounds were present in detectable amounts (see Table J-2). BHC-Alpha was detected at R-19 and R-20 at 0.3 μg/kg and 0.4 μg/kg, respectively. BHC-Beta was the most prevalent. The high value, 4.5 μg/kg, occurred at R-1. BHC-Gamma (Lindane) was detected at the same stations at concentrations of 2.2 and 2.1 μg/kg, respectively. Heptachlor epoxide showed detectable residue at R-13 and R-24. (1.5 μg/kg and 1.0 μg/kg, respectively.) Dieldrin was also distributed at these stations with R-13 having 2.0 μg/kg and R-14 having 1.0 μg/kg. The latter Dieldrin value also occurred at R-16. o,p'-DDT was detected at R-1 and R-12 at concentrations of 8.5 and 12.0 μg/kg, respectively. p-p' DDE, was detected at 1.0 μg/kg at R-12. Thus, pesticide in sediments analyses showed only patchy distribution of selected compounds. The most prevalent occurrence of detected amounts of chlorinated hydrocarbons was between R-12 and R-16 on the Lower Black Warrior River.

3.2 Biological

The results of microbiological, plankton, benthological and aquatic macrophyte studies are presented in this section. Selected data have been summarized and/or presented graphically in this section. Raw data from the monthly collections can be found in the Appendices.

The section dealing with microbiological and associated parameters has been sub-divided into river sections which agree with those described in Section 3.1. In Sections 3.2.2 through 3.2.4, these river segmentations have been slightly revised as explained in those sections.

In addition to these sections, 3.2.5 presents the results of three Algal Growth Potential (AGP) tests. This section is not summarized by river section due to the testing procedure (see 2.2.6). The final section presents the results of the aquatic macrophyte survey, which considers only the river basins and Demopolis Lake as study subdivisions. Thus, the presentation of biological data has been defined on the basis of systematic differences in various river reaches. The varying presentations, which are complete in each section, are used to highlight these differences.

3.2.1 Microbiological and Associated Parameters

Adenosine Triphosphate

Levels of adenosine triphosphate (ATP) showed extreme seasonal fluctuations, but were relatively equal in average distribution throughout the study area. It should be noted that analysis of this data is rendered somewhat incomplete because of the missing data from May and June 1979 (Tables A-5 and A-6).

The highest average ATP value was 56 ng/l which occurred at R-5 (Table 3-20). The lowest average value was 10 ng/l which occurred at R-10 (Table 3-21). 300 ng/l was the highest single ATP value obtained and was recorded at R-9 in October 1979 (Table A-10). ATP levels below detectable quantities (50 ng/l in 1978 and 10 ng/l in 1979) occurred at all stations on several occassions. December 1978 (Table A-4) and February 1979 (Table A-5) had all stations recording non-detectable ATP levels. The overall highest levels of ATP occurred in October 1979 (Table A-10).

Warrior Lake and Demopolis Lake had equal study averages, 33 ng/l (Tables 3-20 and 3-23, respectively). The Tombigbee River had a marginally lower average concentration of ATP, 31 ng/l (Table 3-22). The Lower Black Warrior River had the minimum average, 27 ng/l (Table 3-21). Although there was a slight sectional differentation, the season fluctuation (<10-300 ng/l) was much greater.

Chlorophyll *a, b, c*

Active chlorophyll *a* (chlorophyll *a* corrected for pheophytin) showed large seasonal variations with only minor variations in average values for the river sections. Chlorophyll *b* and *c* were also measured by the trichromatic technique. However, a growing body of literature disputing the validity of these estimates has indicated that these data are best left in raw form as given in Appendix A. The literature suggests that estimates of chlorophyll *b* and *c* are in error up to 75% when produced by the trichromatic method (Trotter and Hendriks, 1979)

Chlorophyll *a* had a maximum average of 15 μg/l which occurred at R-20 (Table 3-22). The minimum average was 2 μg/l, which was recorded at R-1 (Table 3-20). The single highest concentration of chlorophyll *a*, 41 μg/l, occurred at R-20 during late August 1979 (Table A-9). The minimum chlorophyll *a* value detected was <1 μg/l, which was recorded at several stations during December 1978 (Table A-4). Generally, the lowest levels of chlorophyll *a* were observed during December 1978 (Table A-4) and the highest levels during July 1978 (Table A-1).

The Tombigbee River had the maximum average chlorophyll *a* levels during the study period, 10 μg/l (Table 3-22). Demopolis Lake and the Lower Black Warrior had slightly lower average values, 8 μg/l each (Tables 3-23 and 3-21, respectively). The minimum average level of chlorophyll *a*, 7 μg/l, was recorded for the Warrior Lake (Table 3-20). These river section differences are minor. The major variation for chlorophyll *a* occurred seasonally.

TABLE 3-20. Means and Ranges of Microbiological and Associated Parameters at Main River Stations, Middle Black Warrior River Stations R-1 thru R-9 (Warrior Lake), July 1978 through October 1979.

PARAMETER	R - 1	R - 2	R - 3	R - 4	R - 5	R - 6	R - 7	R - 8	R - 9	$\bar{x}$
ATP (ng/l)	11 (<10 - 64)	22 (<10 - 67)	16 (<10 - 16)	30 (<10 - 138)	56 (<10 - 275)	41 (<10 - 143)	27 (<10 - 69)	53 (<10 - 201)	40 (<10 - 300)	33
Chlorophyll a (µg/l)	2 (1 - 4)	3 (1 - 4)	5 (1 - 14)	8 (1 - 26)	13 (<1 - 37)	12 (1 - 28)	8 (1 - 26)	7 (<1 - 13)	6 (1 - 12)	7
Fecal Coliforms #/100ml	1061 (9 - 3130)	869 (89 - 2610)	550 (<1 - 170)	257 (<1 - 1410)	117 (<1 - 450)	55 (<1 - 210)	63 (<1 - 350)	87 (<1 - 360)	57 (<1 - 210)	346
Fecal Streptococci #/100ml	178 (19 - 500)	125 (7 - 600)	109 (4 - 390)	80 (4 - 380)	121 (16 - 370)	173 (3 - 330)	107 (2 - 320)	180 (1 - 780)	68 (1 - 290)	127
FC/FS Ratio[1]	5.7	6.9	5.1	3.2	0.9	0.3	0.6	0.4	0.8	2.7
Dissolved Organic Carbon (mg/l)	4.4 (<2.0 - 10.9)	4.5 (<2.0 - 9.6)	4.3 (<2.0 - 10.1(	4.1 (<2.0 - 9.8)	3.0 (<2.0 - 9.4)	4.0 (<2.0 - 9.2)	4.5 (<2.0 - 10.3)	3.9 (<2.0 - 8.3)	3.9 (<2.0 - 9.7)	4.1
Total Organic Carbon (mg/l)	4.8 (<2.0 - 11.4)	4.0 (<2.0 - 10.7)	4.1 (<2.0 - 11.2)	4.2 (<2.0 - 10.2)	4.0 (<2.0 - 11.5)	4.2 (<1.0 - 5.8)	5.3 (<2.0 - 8.9)	4.2 (<2.0 - 9.7)	3.8 (<2.0 - 8.3)	4.3

1 Represents the ratio of the average coliform and streptococci numbers.

TABLE 3-21. Means and Ranges of Microbiological and Associated Parameters at Main River Stations, Middle Black Warrior River, Stations R-10 thru R-16 (Lower Black Warrior River), July 1978 thru October 1979

PARAMETER	R - 10	R - 12	R - 13	R - 14	R - 15	R - 16	$\bar{x}$
ATP (ng/l)	10 (<10 - 24)	30 (<10 - 52)	40 (<10 - 70)	24 (<10 - 112)	18 (<10 - 56)	49 (<10 - 100)	27
Chlorophyll a (µg/l)	8 (<1 - 28)	10 (1 - 31)	8 (2 - 23)	8 (2 - 24)	7 (2 - 19)	8 (<1 - 30)	8
Fecal Coliforms #/100ml	54 (<1 - 208)	72 (<1 - 297)	54 (<1 - 238)	66 (<1 - 391)	59 (1 - 286)	11 (<1 - 30)	53
Fecal Streptococci #/100ml	217 (<1 - 1500)	95 (20 - 470)	437 (4 - 3950)	62 (12 - 190)	205 (<1 - 1410)	82 (1 - 420)	183
FC/FS Ratio[1]	0.2	0.8	0.1	1.1	0.2	0.1	0.2
Dissolved Organic Carbon (mg/l)	4.7 (<2.0 - 8.0)	4.7 (<2.0 - 9.6)	4.8 (<2.0 - 12.7)	4.3 (<2.0 - 9.6)	4.2 (<2.0 - 8.9)	4.3 (<2.0 - 8.5)	4.5
Total Organic Carbon (mg/l)	4.9 (<2.0 - 9.0)	4.9 (<2.0 - 10.4)	5.4 (<2.0 - 15.3)	5.8 (<2.0 - 13.9)	5.3 (<2.0 - 12.5)	5.4 (<2.0 - 12.0)	5.3

[1] Represents the ratio of the average coliform and streptococci numbers.

TABLE 3-22. **Means and Ranges of Microbiological and Associated Parameters at Main River Stations, Middle Tombigbee River Stations R-17 thru R-21 (Tombigbee River), July 1978 thru October 1979**

PARAMETERS	R - 17	R - 18	R - 19	R - 20	R - 21	$\bar{x}$
ATP (ng/l)	27 (<10 - 130)	33 (<10 - 133)	28 (<10 - 103)	13 (<10 - 88)	53 (<10 - 153)	31
Chlorophyll a (μg/l)	6 (2 - 13)	8 (2 - 22)	9 (<2 - 18)	15 (<1 - 41)	11 (2 - 25)	10
Fecal Coliforms #/100ml	201 (<1 - 1800)	601 (<1 - 3620)	518 (<1 - 3480)	529 (<1 - 4380)	234 (<1 - 1130)	418
Fecal Streptococci #/100ml	211 (14 - 900)	521 (1 - 1810)	632 (5 - 3720)	593 (<1 - 2620)	343 (4 - 1120)	460
FC/FS Ratio[1]	0.9	1.1	0.8	0.8	0.7	0.9
Dissolved Organic Carbon (mg/l)	7.8 (<2.0 - 17.0)	7.1 (<2.0 - 19.3)	7.4 (<2.0 - 16.2)	8.1 (<2.0 - 14.1)	6.4 (<2.0 - 15.5)	7.4
Total Organic Carbon (mg/l)	8.0 (<2.0 - 21.6)	8.4 (<2.0 - 19.0)	9.5 (<2.0 - 18.0)	9.5 (<2.0 - 17.4)	9.3 (<2.0 - 15.4)	8.9

1 Represents the ratio of the average coliform and streptococci numbers.

TABLE 3-23. Means and Ranges of Microbiological and Associated Parameters at Main River Stations, Middle Black Warrior and Tombigbee River Stations R-22 and R-23 (Demopolis Lake), July 1978 thru October 1979

PARAMETER	R - 22	R - 23	$\bar{x}$
ATP (ng/l)	34 (<10 - 240)	31 (<10 - 70)	33
Chlorophyll a (μg/l)	8 (2 - 14)	8 (1 - 18)	8
Fecal Coliforms #/100ml	368 (2 - 2650)	182 (<1 - 790)	275
Fecal Streptococci #/100ml	293 (4 - 880)	276 (<1 - 880)	285
FC/FS Ratio[1]	1.3	0.7	1.0
Dissolved Organic Carbon (mg/l)	5.9 (<2.0 - 8.5)	5.4 (<0.5 - 12.0)	5.7
Total Organic Carbon (mg/l)	8.2 (<2.0 - 12.9)	7.2 (<2.0 - 14.5)	7.8

[1] Represents the ratio of the average coliform and streptococci numbers.

Dissolved Organic Carbon

Levels of dissolved organic carbon (DOC) evidenced strong seasonal and river sectional trends. R-20 had the highest average DOC, 8.1 mg/l (Table 3-22). The lowest average concentration of DOC was 3.0 mg/l, recorded at R-5 (Table 3-20). R-17 recorded the maximum level of DOC, 21.6 mg/l, in August 1978 (Table A-2). Non-detectable levels, <2.0 mg/l, occurred at all stations in June 1979 (Table A-7). This was overall lowest month for DOC levels. The highest overall levels occurred in October 1978 (Table A-3).

The Tombigbee River had the highest overall average DOC concentrations, 7.4 mg/l (Table 3-22). Warrior Lake had a study period average of 4.1 mg/l (Table 3-20), the lowest average of all sections. The Lower Black Warrior River had a moderately higher level, 4.5 mg/l (Table 3-21). Demopolis Lake had an intermediate average DOC level, 5.7 mg/l (Table 3-23). Thus, there were some moderate section variations in DOC, but seasonal fluctuations were much larger.

Total Organic Carbon

Total organic carbon (TOC) roughly paralleled the seasonal and sectional trends for dissolved organic carbon, with only slightly higher average levels in most river sections. The highest level of TOC recorded was 9.5 mg/l which occurred at R-19 and R-20 (Table 3-22). The lowest level was 3.8 mg/l which occurred at R-9 (Table 3-20). The maximum concentration observed during the study was 19.0 mg/l at R-18 in February 1979 (Table A-5). Non-detectable TOC values (<2 mg/l) were recorded at all stations in June 1979 (Table A-7). This represented the overall lowest month for TOC. Generally, the highest TOC concentrations occurred in October 1978 (Table A-3).

Fecal Coliform

Main River Stations. Levels of fecal coliform bacteria (FC) were quite variable, both seasonally and by river sections. R-1 had the highest average FC concentration, 1061 (Table 3-20; all values are as number per 100 milliliters). The lowest average FC concentration was 11, which occurred at R-16 (Table 3-21). The single highest numerical value recorded was 4380 at R-20 in May 1979 (Table A-6). Note that R-13 through R-15 had levels "too numerous to count" in October 1978 (Table A-3), although this is not indicative of numbers higher than the maximum value stated above. The minimum level of FC recorded, <1, occurred at several stations during July 1978 (Table A-1), August 1978 (Table A-2) and October 1978 (Table A-3). Generally, the highest fecal coliform levels were observed in May 1979 (Table A-6); the lowest levels were observed in August 1978 (Table A-2).

Warrior Lake, especially R-1 and R-2, showed high average values. The river section average was 346 (Table 3-20). This value was very much reduced in the Lower Black Warrior River, with the study period average being only 53 (Table 3-21). The Tombigbee River had the overall highest average value, 418 (Table 3-22). Demopolis Lake had moderately high FC levels, with an average of 275 (Table 3-23). Thus, both seasons and river sections produced large variations in FC levels.

Bacteriological Stations. The results of FC analyses at bacteriological stations C-1 through C-4 are presented in Appendix K. Station

C-4 typically had the highest values with a study average of 493 and a range of 1 to 3700. C-2 had the lowest values with a study average of 46 and a range of 0 to 373. C-1 and C-3 had intermediate averages, 67 and 50 respectively. C-1, C-2 and C-3 had their maximum levels in February 1979, C-4 had a maximum in October 1979.

Fecal Streptococci

Main River Stations. As with FC levels, concentrations of fecal streptococci (FS) showed large seasonal and river section variations, R-19 (Table 3-22) had the highest average FS level, 632 (all values represent number per 100 millimeters). The lowest average level of FS, 62, occurred at R-14 (Table 3-21). The FS maximum, 3950, occurred at R-13 during July 1979 (Table A-8). The minimum value was <1 which occurred at several stations in various months, primarily July and August 1978 (Tables A-1 and A-2, respectively). Generally, the highest values occurred in July 1979 (Table A-8) and the lowest during August 1978 (Table A-2).

The Tombigbee River had the overall highest FS values, 450 (Table 3-22). Warrior Lake, with a study period average of 127 (Table 3-20), had the overall lowest FS levels. The Lower Black Warrior River was moderately higher, 183 (Table 3-21). Demopolis Lake had an intermediate average, 285 (Table 3-23). These results indicate that both seasonal factors and river basin characteristics caused FS levels to be widely varied.

Bacteriological Stations. Station C-2 and C-4 had the greatest average FS levels, 159 and 204 respectively (Table K-1). The other two stations had study period averages of approximately 100. C-1 through C-3 showed the highest levels in February 1979. C-4 had its highest FS level, 930, in October 1979. The maximum value, 1040, occurred at C-2 during this month.

FC:FS Ratio

Main River Stations. Average FC:FS ratios (herinafter referred to as ratios) have been calculated in Tables 3-20 through 3-23 based on average FC and FS levels as given on the same tables. Although slightly different averages result from the arithmatic mean of the monthly ratios, the ratios in these tables are useful in locating trends of this calculated parameter. The highest ratio was 6.9, occurring at R-2 (Table 3-20), which indicates high levels of fecal coliforms as compared to fecal streptococci. The lowest calculated ratio, 0.1, occurred at R-13 and R-16 (Table 3-21), indicates higher fecal streptococci at these stations. Warrior Lake had a section average of 2.7, the Lower Black Warrior River had a ratio of 0.2 for an average. The Tombigbee River had nearly equal levels of FC and FS, with a study period ratio of 0.9. Lake Demopolis had the same result, with an average ratio of 1.0. These results indicate tremendous variation between stations in relative FC and FS loadings.

Seasonally, the highest ratios occurred in December 1978 (Table A-4) and the lowest occurred in August 1978 (Table A-2) when all ratios were calculated as <1.0. The highest ratio was 153, which occurred at R-1 in July 1978. These results indicate a moderate seasonal fluctua-

tion which does not effect the trend of FC:FS loading at any one station or river section.

Bacteriological Stations. All bacteriological stations showed a predominance of ratios greater than 1.0, with a maximum of >25 at C-3 and C-4 in September 1978 (Table K-1). In June and July 1979, all stations showed ratios less than 1.0, which by August 1979 had gone over 1.0 again. These results generally indicate FC loadings in tremendous excess over FS loadings.

3.2.2 Phytoplankton

The designation of river basin sections has been revised for presentation of the remaining biological results. These new designations generally reflect environmental changes (Depth, current velocity) which affect biological communities. To facilitate reading this presentation the following summary is presented:

Stations	Section Designation
R-1 to R-5	Upper Warrior Lake
R-6 to R-10	Lower Warrior Lake
R-12 to R-16	Lower Black Warrior River
R-17 to R-21	Tombigbee River
R-22 to R-23	Demopolis Lake

Results of the monthly collections of phytoplankton are found in Appendix L. The tables of this appendix list all taxa identified and the number per milliliter. These data have been reduced to the tables and the figure in this section.

Table 3-24 is a complete listing of all algal taxa identified during the course of the study. The algae represent 200 genera and species divided among the five major divisions. The Chlorophyta (green algae) accounted for 55% of the total number of taxa identified. In rank order the remaining divisions were Chrysophyta (yellow green algae, primarily diatoms), 29%; Cyanophyta (blue green algae), 9%; Euglenophyta (euglenoids), 6%; and Pyrrophyta (dinoflagellates), 1%.

The green algae were overwhelmingly represented by the members of the Oöcystaceae and the Scenedesmaceae. These, with the remaining members of the Chlorococcales, accounted for approximately 80% of all green algae. Species from the other represented orders generally accounted for low numbers throughout the study (see Appendix L). The yellow green algae were represented predominantly by diatoms (*Ophiocytium* and *Dinobryon* being the exceptions). Most diatom species found were pennate forms; however, centric forms often accounted for large numbers (Appendix L). The blue greens were mainly represented by filamentous forms with only three coccoid genera being identified. Taxonomy of these groups is taken from the revisions of Drouet and Daily (19[illegible]) and Drouet (1967, 1976 and 1978), thus, yielding short taxa list for blue green forms. Thus, the green algae had the over-

Table 3-24. Phylogentic Listing of all Algal Taxa Encountered, Middle Black Warrior and Tombigbee Rivers, July 1978 through October 1979.

Note: This taxonomic listing is based on the phylogeny of Smith (1950), unless otherwise indicated.

DIVISION CHLOROPHYTA
CLASS CHLOROPHYCEAE
ORDER VOLVOCALES
Family Chlamydomonadaceae
Genus *Chlamydamonas* Ehr. sp.
Family Volvocaceae
Genera *Eudorina elegans* Ehr.
Gonium pectorale Muell.
Pandorina morum Bory.
ORDER TETRASPORALES
Family Palmellaceae
Genera *Gloeocystis* Nageli sp.
G. gigas (Kutz) Lagerh.
Sphaerocystis Schroeteri Chodat
Family Tetrasporaceae
Genus *Schizochlamys compacta* Prescott
Family Coccomyzaceae
Genus *Elakatothrix gelatinosa* Wille.
ORDER ULOTRICHALES
Family Ulothrichasceae
Genus *Ulothrix* Kutz. sp.
U. subtilissima Rubenhorst
ORDER OEDOGONIALES
Genus *Oedogonium* Link sp.
ORDER CHLOROCOCCALES
Family Micractinaceae
Genera *Errerella bornhemiensis* Conrad
Golenkinia paucispina W. and G.S. West
G. radiata Chodat
Micractinium pusillum Fres.
Family Dictyosphaeria
Genus *Dictyosphaerium Ehrenbergianum* Nageli
D. pulchellum Wood
Family Characiaceae
Genus *Schroedaria setigera* (Schroeder) Lemm.
Family Hydrodictyaceae
Genera *Pediastrum biradiatum* Meyen
P. boryanum (Turp.) Meneghini
P. duplex Meyen

TABLE 3-24. (continued)

P. simplex (Meyen) Lemm.
P. tetras var. *tetraedron* (Corda) Rabenhorst
Sorastrum Kutz. sp.
Family Coelastraceae
Genus *Coelastrum cambricum* Archi
C. microporum Nag. (*C. microsporum* Nagi)
C. proboscideum Bohlin
C. reticulatum Dung.) Senn.
Family Oocystaceae
Genera *Ankistrodesmus* (Corda) Ralfs. sp.
A. convolutus Corda
A. falcatus (Corda) Ralfs.
A. falcatus var. *mirablis* W. and G.S. West
Chodatella Chodati (Bernard) Ley.
C. Droescheri Lemm.
C. quadriseta (Lemm.) G.M. Smith
C. subsalsa Lemm.
Closteriopsis longissima Lemm.
Franceia ovalis (France) Lemm.
Gloeoactinium limneticum G.M. Smith
Kirchneriella Schmidle sp.
K. contorta (Schmidle) Bohlin
K. lunaris (Kirch.) Mobius
K. lunaris var. *irregulare* G.M. Smith
K. obesa (West) Schmidle
K. obsea var. *major* (Bernard) G.M. Smith
Nephyrocytium Nageli spp.
Oocystis Nageli spp.
O. Borgei Snow
O. lacustris Chodat
Pachycladon umbrinus G.M. Smith
Quadrigula Chodati (Tanner-Fullman) G.M. Smith
Q. lacustris (Chodat) G.M. Smith
Selenastrum gracile Reinsch.
S. Westii G.M. Smith
Tetraedron caudata (Corda) Hansg.
T. minimum (A. Br.) Hansg.
T. regulare Kutz
T. trigonum var. *gracile* (Reinsch.) de Toni
Treubaria triappendiculata Barnard
Westella botryoides (W. West) de Wildm.
W. linearis G.M. Smith
Family Scenedesmaceae
Genera *Actinastrum Hantzschii* Lagerh.
Crugenia Morren spp.
C. appiculata (Lemm.) Schmidle
C. crucifera (Wolle) Collins
C. fenestrata Schmidle
C. irregularis Willie

C. quadrata Morren
C. rectangularis Wille
C. tetrapedia (Kirch.) W. and G.S. West
C. truncata G.M. Smith
Scenedesmus Meyen spp.
S. abundans (Kirch.) Chodat
S. acuminatus (Lagerh.) Chodat
S. acutiformis Schroeder
S. armatus (Chodat) G.M. Smith
S. armatus var. *bicauda* G.M. Smith
S. bijuga (Turp.) Lagerh.
S. bijuga var. *alternans* (Reinsch) Borge
S. brasiliensis Bohlin
S. deticulatus Lagerh.
S. dimorphus (Turp.) Kutz.
S. hystrix Lagerh.
S. opoliensis P. Richter
S. obliquus (Turp.) Kutz
S. quadricauda (Turp.) Breb.
S. serratus (Corda) Bohlin
Tetrastrum Chodat sp.
T. anomalum (G.M. Smith)
T. glabrum Ahlstrom and Tiffany
T. heteracanthum (Schiller) Chodat
T. staurogeniaforme (Schroeder) Lemm.

ORDER ZYGENEMATALES
Family Zygnemataceae
Genera *Mougeotia* (C.A. Agardh) Wittrock sp.
Spirogyra Link spp.
Family Mesotaeniaceae
Genus *Netrium digitus* (Ehr.) Itz. and Rothe
Family Desmidiaceae
Genera *Arthrodesmus* Ehr. spp.
A. incus (Breb.) Hass.
Closterium Nitzsch. spp.
C. gracile var. *elongatum* W. and G.S. West
Cosmarium Corda spp.
Desmidium C.A. Agardh
Euastrum Ehr. spp.
E. binale var. *gutwinskii* (Schmidle) Krieg
E. denticulatum (Kirch.) Gay
Spondylosium planum (Wolle) West
Staurastrum Meyen spp.
S. arachne Var. *curvatum* W. and G.S. West
S. chaetocera (Schroeder) G.M. Smith
S. dejectum Breb.

TABLE 3-24. (continued)

DIVISION EUGLENOPHYTA
CLASS EUGLENOPHYCEAE
ORDER EUGLENALES
Family Euglenaceae
Genera *Euglena* Ehr. spp.
Lepocinclis Perty spp.
Phacus Dujardin spp.
P. orbicularis Huebner
Trachleomonas Ehr. spp.
T. charkowiensis var. *affine* (Sku.) Defl.
T. euchlora (ehr.) Lemm.
T. gibberosa Playfair
T. horrida Palmer
T. schauinslandii Lemm.
T. superba (Swir.) Deflandre
T. volvicina Ehr.

DIVISION PYRROPHYTA
CLASS DINOPHYCEAE
ORDER PERIDINALES
Family Peridinaceae
Genus *Peridinium* (Ehr.) Stein spp.
Family Ceratinaceae
Genus *Ceratium hirudinella* Schrank

DIVISION CHRYSOPHYTA
CLASS XANTHOPHYCEAE
ORDER HETEROCOCCALES
Family Chlorotheciaceae
Genus *Ophiocytium capitatum* Wolle

CLASS CHRYSOPHYCEAE
ORDER CHRYSOMONADALES
Family Ochromonadaceae
Genus *Dinobryon* Ehr. sp.
D. bavaricum Imhof
D. sertularia Ehr.

TABLE 3-24. (continued)

CLASS BACILLARIOPHYCEAE
ORDER CENTRALES
Family Cosinodiscaceae
Genera *Cyclotella* Kutz spp.
C. Menehiginiana Kutz
C. glomerata
C. stelligera Cleve and Grunow
Melosira ambigua (Grunow) O. Muller
M. distans
M. granulata (Ehr.) Rolfs
M. granulata var. *angutissima* Muller
M. varians Agradh.
Stephanodiscus Ehr. spp.
S. hantzschii
Family Rhizosoleniaceae
Genus *Rhizosolenia* Ehr. Sp.
ORDER PENNALES
Family Tabellariaceae
Genus *Tabellaria fenestrata* (Lyngbye) Kutz.
Family Meridionaceae
Genus *Meridion circulare* (Grev.) Ag.
Family Fragilariaceae
Genera *Asterionella formosa* Hass.
Fragilaria Lyngbye spp.
F. crotonensis Grunow
Synedra Ehr. spp.
S. actinastroides Husteadt
S. ulna (Nitzsch) Ehr.
S. ulna var. longissima (W. Smith) Brun.
S. ulna var. ryhncocephla
Family Eunotiaceae
Genus *Eunotia* Ehr. spp.
E. naeglii var. *naeglii* Mignla
E. pectinalis (Kutz.) Rabenhorst
Family Achnanthaceae
Genera *Achnanthes* Bory. spp.
Cocconeis placentula Ehr.
C. disculus (Schum.) Cleve.
Family Naviculaceae
Genera *Capartogramma crucicula* (Grun. *ex* Cl.) Ross
Gyrosigma Hass. sp.
Navicula Bory spp.
N. cryptocephala Kutz
N. pupuala Kutz
Nedium Pfitzer sp.
Pinnularia Ehr. spp.
Pleurosigma delicatulum W. Smith
Stauroneis Ehr. spp.
S. anceps Ehr.
S. phoenicenteron (Nitzsch) Ehr.

TABLE 3-24. (continued)

Family Gomphnemataceae
    Genus *Gomphonema* Agardh. spp.
Family Cymbellaceae
    Genera *Amphora* Ehr. sp.
        Cymbella Agardh. spp.
Family Nitzschiaceae
    Genera *Hantzschia virgata*
        Nitzschia Hass. spp.
        N. acicularis W. Smith
        N. filiformis
        N. obtusa var. *scalpelliformis* Grunow
        N. pulea (Kutz.) W. Smith
        N. sigmoidea (Ehr.) W. Smith
        N. sublinaaris Hustedt
Family Surirellaceae
    Genera *Cymatopluera solea* (Breb.) W. Smith
        Surirella angustata Kutz
        S. ovalis (Ehr.) Grunow

DIVISION CYANOPHYTA
  CLASS MYXOPHYCEAE
    ORDER CHROOCOCCALES
      Family Chroococcaceae (after Drouet and Daily, 1956)
        Genera *Agmenellum quadriduplicatum* Breb.
          Anacystis incerta Dr. and Daily
          A. thermale (Kutz) Dr. and Daily
          Gomphosphaeria aponica (Kutz) Dr. and Daily
          G. wichurae Dr. and Daily
    ORDER HORMOGONALES
      Family Oscillatoriaceae (after E.L. Cooke, 1967)
        Genera *Arthrospira jenneri* (Kutz.) Stizenberger
          Lyngbya contorta Lemm.
          Oscillatoria Vaucher spp.
          O. limnosa Agardh
          O. prolifica (Grev.) Gomont
          O. tenerrimis
          O. tenuis Agardh
          Spirulina Turp. spp.
      Family Nostocaceae (after F. Drouet, 1978)
        Genera *Anabaina oscillarioides* Bory. Drouet
          A. spiroides Klebahn
          Anabaenopsis circularis (W. and G.S. West) Miller
          Nostoc commune Vaucher
      Family Rivulareaceae
        Genus *Raphidiopsis curvata* Fritsch and Rich

all highest number of taxa identified with diatoms and blue greens contributing moderate percentages. However, the majority of taxa identified did not reflect dominance in terms of numbers or frequently even community composition.

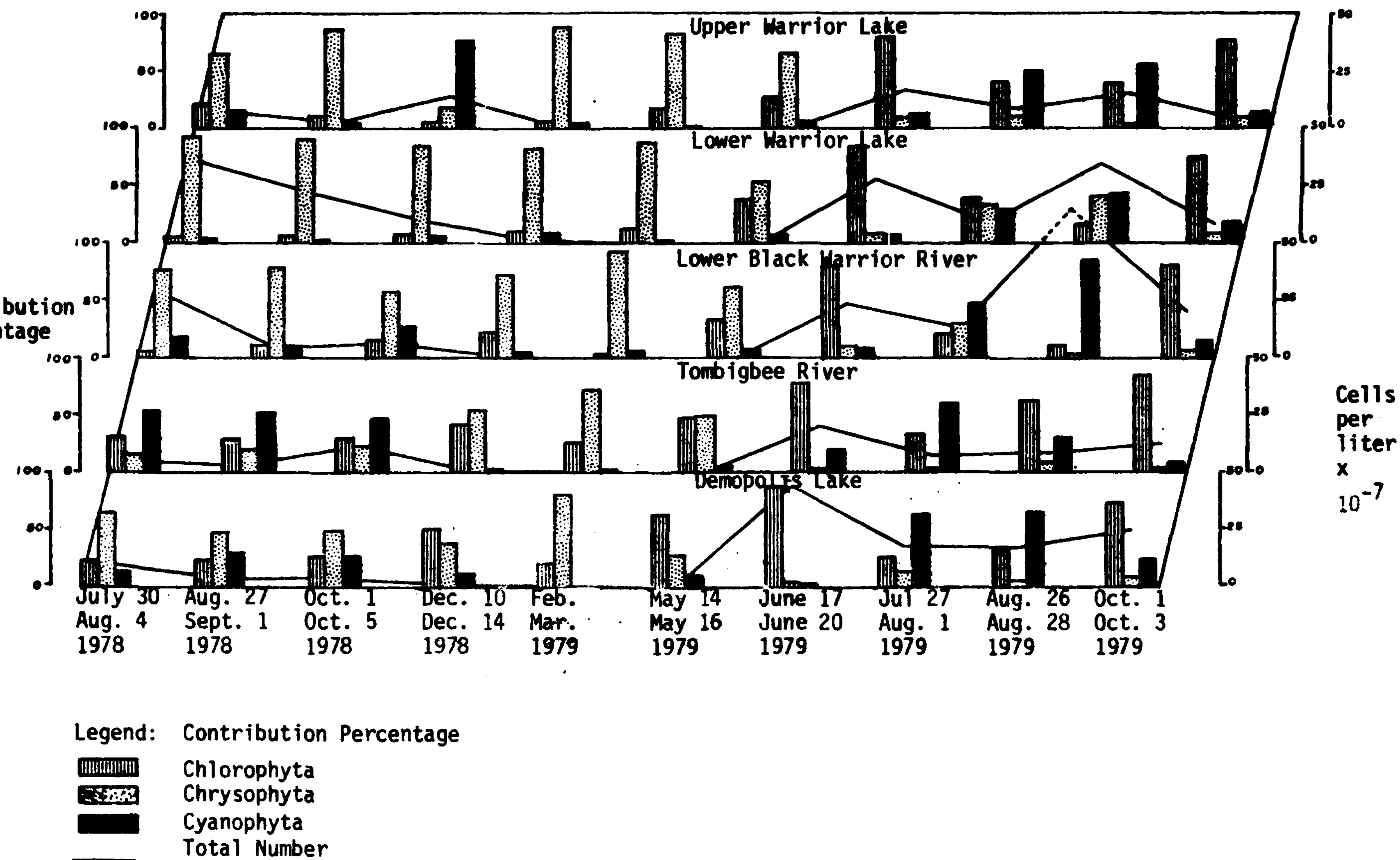
Figure 3-1 presents a monthly comparison of community compositions and total numbers by river sections. The Black Warrior River (all sections) had a phytoplankton community almost wholly composed of diatoms between July 1978 and May 1979. During this period Warrior Lake had the highest numbers of phytoplankton of any river section. An exception to this occurred in October 1978 when the blue green algae contributed 75% to the Upper Warrior Lake and that section had the highest total number of phytoplankton of all sections. During this same six-month period the Tombigbee River and Demopolis Lake had trends different from the Black Warrior River that were not as consistent as those for the Black Warrior River.

During July through October 1978, the Tombigbee River phytoplankton community was primarily composed of blue green algae, although the other divisions were well represented. In December 1978 the composition dramatically changed with blue greens essentially disappearing and diatoms assuming the major portion of the phytoplankton community. Demopolis Lake phytoplankton, in contrast to the other sections, was relatively evenly distributed among the principal orders between July and December 1978. This trend ended with the February 1979 collection which had 80% diatoms. Another major composition change occurred in the Demopolis Lake phytoplankton community in May 1979 when the green algae contributed 60% of the phytoplankton. This was the only section with a majority of green algae during the first half of the study.

During the second half of the study, phytoplankton populations went through a series of community shifts. In June 1979 all sections were composed primarily of green algae, which was almost wholly represented by *Ankistrodesmus convolutus* (Table L-7). Additionally, total numbers of algae rose from very low levels to moderately high to very high levels, especially in the Tombigbee River and Demopolis which had their highest total numbers for the study (2.3×10^8 and 4.8×10^8 cells/liter, respectively). This early summer community was quickly replaced with blue green algae becoming dominant in July, 1979 in most sections. All sections experienced a drop in total numbers of phytoplankton during this month. August 1979 continued in this pattern, with the blue greens remaining the largest percentage group in most sections (the Tombigbee River had a higher green algae component). Warrior Lake and the Lower Black Warrior River had maximum phytoplankton levels during this month with 3.5×10^8 and 7.2×10^8 cells/liter respectively. October 1979 had a decrease of blue green algae to 10-25% in all sections with the greens rising to $\geq 75\%$. Total numbers had moderately declining values in all sections.

These results demonstrate that most sections of the study area have strong seasonal variations in algal assemblages, but these variations do not repeat from year to year. An assessment of the dominant algal species (as defined by the two species contributing the first and second largest number of cells during each collection), reveals a similar pattern of change as the community composition charts (Figure 3-1). Table 3-25 lists the total number of stations during each collection at which a given species was a dominant, either first or second

FIGURE 3-1. Community Composition and Total Numbers of Phytoplankton in Major River Sections, Middle Black Warrior and Tombigbee River, July 1978 thru October 1979.



place. Trips 1 through 5 (June 1978 through May 1979) were primarily dominated by diatoms (Figure 3-1). These diatoms were the centric, chain forming species *Melosira granulata, M. distans* and *Cyclotella glomerata* (Table 3-25). It can also be seen that the occasional high percentage of blue green algae during these months was due almost entirely to the coccoid colonial *Agmenellum quadriduplicatum (Merismopedia punctata)*. The occurrence of several benthic diatoms (*Nitzschia* spp., *Navicula cryptocephala* and *Stauroneis* spp.) was interesting in the light of extremely low numbers of phytoplankton during Trip 5, February 1979 (Table L-5). As noted above, the shift to the green algae as a percentage contribution dominant was caused by a bloom of *Ankistrodesmus convolutus* during Trip 7, June 1979. The summer levels of blue green in 1979 were once again attributed to *Agmenellum quadriduplicatum*, with occasional occurrences of high levels of *Oscillatoria* (R-4, R-16 through R-20, July 1979, Table L-8) and *Anabaenopsis circularis* (R-21, July 1979, Table L-8). The green algae dominance during Trip 10, October, 1979, was again due to *Ankistrodesmus convolutus*, although with much lower total numbers than the spring bloom (Table L-10).

In summary, phytoplankton communities during the study period showed summer maxima (June 1978 and June/August 1979) with diatoms being the major component in 1978 and greens in 1979. Lowest total numbers were observed in the winter and early spring (December 1978 through May 1979). Although many species were occasionally abundant, those algae which showed the dominant position were quite consistent. The blue green coccoid *Agmenellum* was the most frequent dominant with centric, chain forming diatoms, *Melosira* and *Cyclotella glomerata* being the most common. *Ankistrodesmus convolutus* accounted for 60% of the occurrences of green algal dominances, and twelve other species made up the remaining 40% of the green algal dominance. Phytoplankton numbers in the Upper Warrior Lake and the Tombigbee River were relatively low in each collection. Lower Warrior Lake had the most consistent high levels of phytoplankton, with Demopolis Lake having levels in late 1979 about tenfold as high as numbers during the same period of 1978. The Lower Black Warrior River had the overall study period maximum for phytoplankton numbers in August 1979. Thus, for phytoplankton trends in the Middle Black Warrior and Tombigbee Rivers, the marked shift in dominance and total numbers patterns between May and June 1979 which did not return to the trends of the summer and autumn of 1978 was the most significant observation for this study.

3.2.3 Zooplankton

(NOTE: River basin sections are as described in Section 3.2.2).

Results of monthly collections of zooplankton are found in Appendix M. The tables in this appendix list all taxa identified and the number of organisms per liter. This data has been reduced to the tables and the figure in this section.

Table 3-26 is a complete listing of all zooplankton taxa identified during the course of the study. The list represents 68 genera and species divided over three phyla: Protozoa, Rotifera and Arthropoda. The latter phylum has two major classes represented in these collections: Cladocera and Copepoda. The Rotifera (rotifers) accounted for [illegible]% of

Table 3-25. Number of Occurrances as One of the Top Two Dominant Taxa by Sampling Trip.

SAMPLING TRIP DATES	7/78	8/78	10/78	12/78	2/79	5/79	6/79	7/79	8/79	10/79	
SAMPLING TRIP NUMBER	1	2	3	4	5	6	7	8	9	10	Σ
Agmenellum quadriduplicatum	10	6	16	2	--	1	4	19	20	11	89
Cyclotella glomerata et. spp.	15	15	14	14	10	--	4	10	5	--	87
Ankistrodosmus convolutus et. sp.	--	1	--	--	--	--	22	8	15	22	68
Melosira granulata et. spp.	9	14	4	15	7	10	2	--	1	1	63
Melosira distans et. spp.	--	--	--	3	13	9	--	--	--	1	26
Asterionella formosa	--	--	--	--	2	12	--	--	--	--	14
Scenedesmus acuminatus et. spp.	--	--	--	6	3	2	--	--	--	--	11
Sphaerocystis schroeteri	--	--	4	--	--	1	2	--	--	1	8
Dictyosphaerium puchellum	--	--	--	--	--	--	6	--	1	--	7
"Filament A"	--	--	--	--	--	2	--	1	1	3	7
Oscillatoria tenuis	--	--	--	--	--	--	1	5	--	--	6
Scenedesmus quadricauda et. spp.	2	--	1	--	--	3	--	--	--	--	6
Cyclotella stelligera et. spp.	--	--	1	2	2	--	--	--	--	--	5
Fragillaria crotonensis	1	--	--	--	1	2	--	--	--	--	4
Oscillatoria limnosa	--	3	--	1	--	--	--	--	--	--	4
Pandorina morum	1	1	--	--	--	1	--	--	--	--	3
Scenedesmus spp.	--	1	1	--	--	1	--	--	--	--	3
Anabaenopsis circularis	--	--	--	--	--	--	--	1	--	1	2
Errerella bornhemiensis	--	--	--	--	--	--	--	--	1	1	2
Micractinium pusillum	--	--	--	--	--	--	1	--	--	1	2
Nitzschia acicularis et. spp.	--	--	--	--	2	--	--	--	--	--	2
Nitzschia sublinearis et. spp.	--	--	--	--	2	--	--	--	--	--	2
Anabaina oscillarioides	--	--	--	--	--	--	--	--	--	1	1
Coelastrum microporum	--	--	--	--	--	--	--	--	--	1	1
Crucigenia spp.	--	--	--	1	--	--	--	--	--	--	1
Gomphosphaeria aponica	--	--	1	--	--	--	--	--	--	--	1
Navicula cryptocephla et. sp.	--	--	--	--	1	--	--	--	--	--	1
Nostoc commune	--	--	--	--	--	--	1	--	--	--	1
Oscillatoria angutissima	--	--	1	--	--	--	--	--	--	--	1
Oscillatoria cf. prolifica	--	1	--	--	--	--	--	--	--	--	1
Scenedesmus hystrix et. spp.	--	--	--	--	--	--	1	--	--	--	1
Scenedesmus armatus et. spp.	--	--	1	--	--	--	--	--	--	--	1
Stauronies spp.	--	--	--	--	1	--	--	--	--	--	1
Ulothrix subtilissima	1	--	--	--	--	--	--	--	--	--	1
(cf. Hormidium sp.*)*	--	--	--	--	--	--	--	--	--	--	
Westella botryoides	1	--	--	--	--	--	--	--	--	--	1

TABLE 3-26. Phylogentic Listing of all Zooplankton Organisms Encountered, Middle Black Warrior and Tombigbee Rivers, July 1978 thru October 1979.

NOTE: The following list represents a compilation of all taxa observed during Sedgwick-Rafter zooplankton enumerations. Taxanomy is according to Jahn and Jahn (1949) for the protozoa and Pennack (1978) for all other taxa. Occasional drift organisms (i.e., insects or nematodes) are not included.

PHYLUM PROTOZOA
SUBPHYLUM MASTIGOPHORA
CLASS PHYTOMASTIGOPHOREA
ORDER CHRYSOMONADIDA
SUBORDER EUCHRYSOMONADINA
Family Coccolithophoridae
Rhizochrysis sp.
ORDER DINOFLAGELLIDA
Family Peridiniidae
Ceratium hirudinella

SUBPHYLUM SARCODINA
CLASS ACTINOPODEA
ORDER HELIOZOIDA
Actinosphaerium sp.
Actinophrys sol
CLASS RHIZOPODEA
ORDER AMOEDIDA
Family Amoebidae
Amoeba sp.
ORDER TESTICIDA
Family Arcellidae
Arcella spp.
Family Difflugidae
Difflugia spp.
Centropyxis spp.

SUBPHYLUM CILIOPHORA
CLASS CILIATEA
SUBCLASS EUCLIATA
ORDER HOLOTRICHIDA
SUBORDER TRICHOSTOMINA
Paramecium sp.
ORDER PERITRICHIDA
SUBORDER MOBILINA
Vorticella sp.
Epistylus nigare

TABLE 3-26. (continued)

PHYLUM ROTATORIA (ROTIFERA)
MONOGONONTA
ORDER FLOSCULARIACEA
Family Conochilidae
Conochilus hippocrepis
C. unicornis
Conochiloides dossarus
C. exiguus
Family Hexarthridae
Hexarthra mira
Family Testudinellidae
Filinia longiseta
Pompholyx[1] sp.
ORDER PLIOMA
Family Notommatidae
Cephalodella sp.
Enteroplea lacustris
Family Sychaetidae
Polyarthra trigla
Synchaeta pectinata
S. stylata
S. spp.
Family Pleosomidae
Pleosoma spp.
Family Gastropodidae
Ascomorpha sp.
Gastropus sp.
Family Trichocercidae
Trichocerca longiseta
T. spp.
Family Asplanchnidae
Asplanchna priodonta
Family Branchionidae
Branchionus angularis
B. calyciflorus
B. caudata
B. havanensis
B. spp.
Kellicottia longiseta
K. bostoniensis
Keratella cochlearis
K. spp.
Manfredium eudactylotum
Mytilina

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[1] *Pompholyx* is included herein to represent rotifers which were grouped as "*Enteroplea*". The occasional occurence of this genus, which was not recognized until the completion of this study, did not contribute more than 15% of the *Enteroplea* identified.

TABLE 3-26. (continued)

Notholca acuminata
N. striata
Platyais quadricornis
P. patulus
Trichotria spp.

Family Colurinae
Lepadella sp.
Family Lecaninae
Lecane spp.
Monostyla sp.

PHYLUM ARTHROPODA
CLASS CRUSTACEA[1]
ORDER CLADOCERA
Family Holopedidae
Holpedium amozonicum
Family Sididae
Diaphanosoma brachyurum
Family Daphnidae
Ceriodaphnia lacustris
Daphnia spp.
Simocephalus sp.
Moina macrocopa
Moinodaphnia sp.
Family Macrothricidae
Macrothrix sp.
Family Eurycercinae
Eurycercus lamellatus
Family Bosminidae
Bosmina longirostris
Family Chydoridae
Alonella sp.
Alona sp.

ORDER COPEPODA
SUBORDER CYCLOPOIDA
Attheyella sp.
Cyclops spp.
Mesocyclops sp.
SUBORDER CALANOIDA
Diaptomus spp.
SUBORDER TARPTICOIDA
ORDER OSTRACODA

[1]Not in Phylogentic order

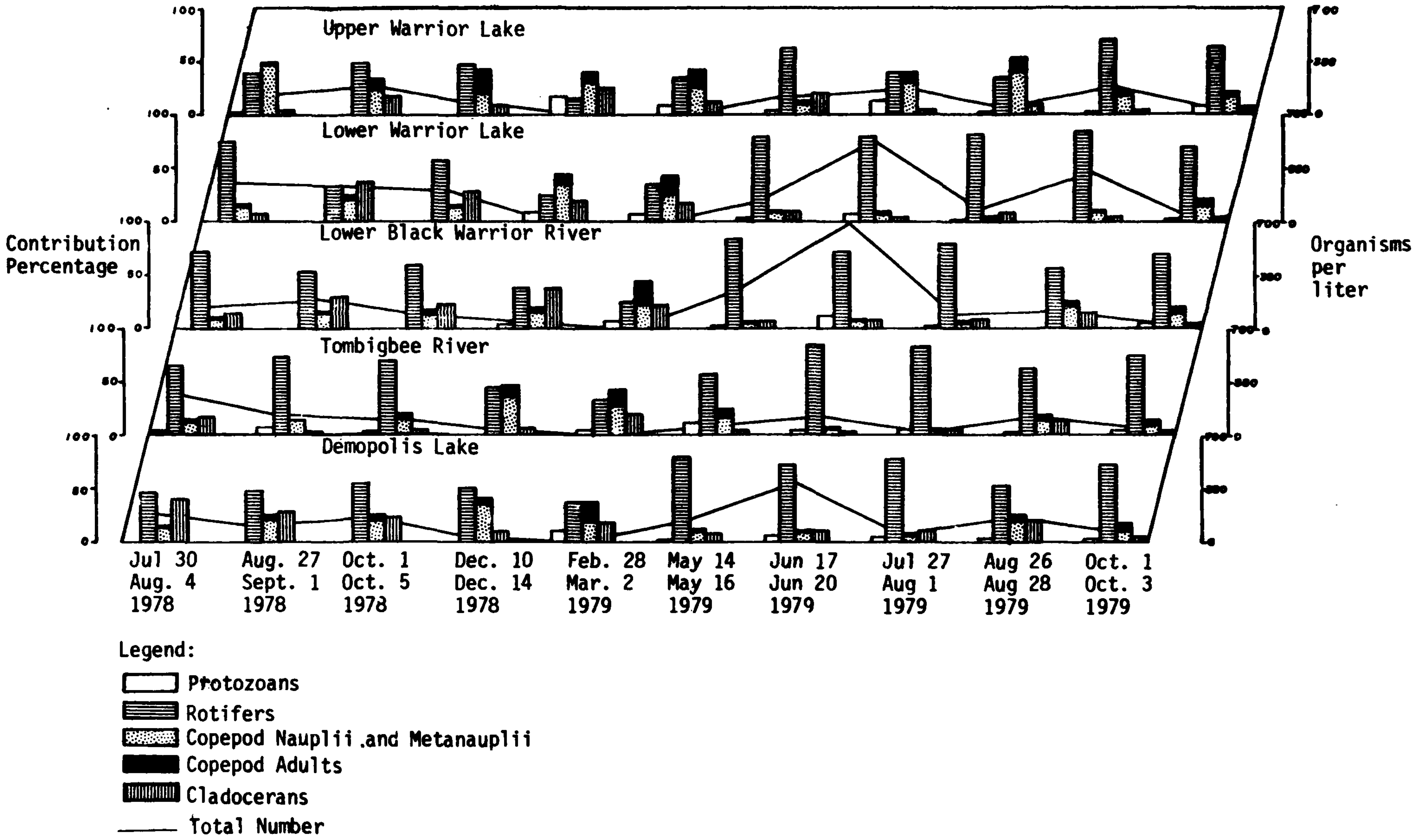
the species identified, the single largest contribution. The remaining phyla and classes were rank ordered as Cladocera (cladocerans), 18%; Protozoa (protozoans), 16%; and Copepoda (copdpods), 6%. The largest group, the rotifers, were divided among two orders and twelve families. The most abundant family was the Brachionidae. The Daphididae was the most abundant cladoceran family and the copepods were relatively evenly divided among the identified groups. The Protozoa genera and species encountered cover many subphyla and classes. However, generic distribution among these major taxa is relatively even. The distribution of numbers of species among the major taxa is very representative of the patterns of dominance in the zooplankton community structure.

Figure 3-2 is a summary of the community composition of zooplankton during the monthly collections. The most obvious feature of the zooplankton community structure is the predominance of rotifers in the majority of collections. During the first three collections of the study, June to October 1978, rotifers were the dominant group in all but two instances. In June 1978 copepod naupli were about 5% greater in occurrence in Upper Warrior Lake. Indeed, during all trips in this period the percentage contribution of copepods was higher in Upper Warrior Lake than any other section. In August 1978, the cladocerans were slightly more abundant than the rotifers in Lower Warrior Lake. Cladocerans also contributed fairly high percentages to the community structure in the Lower Black Warrior River and Demopolis Lake. All sections showed moderately high total numbers (≥200/liter) during the early summer, with a steady decline during late fall. These summer communities began to shift during the first winter collection.

Winter zooplankton collections, December 1978 and February 1979, were more evenly composed of all major groups. Upper Warrior Lake samples during the winter were dominated by copepods, with protozoans having about 10% of the compositions. Lower Warrior Lake had a community structure of about the same distribution. Both of these sections also had relatively high proportions of cladocerans (25%). The Lower Black Warrior River had fewer copepods (20%) with rotifers and cladocerans having about 40% each during December 1978. In the Tombigbee River and Demopolis Lake, rotifers and copepods were the major groups in December. During February 1979, all river sections were dominated by copepods, including many adult forms, with rotifers having moderately high percentages as well. From these relatively even distributions in the winter, which were accompanied by very low numbers (10-50 per liter), early spring zooplankton populations showed marked increases.

Throughout the remainder of the study, including spring, summer and early fall 1979, rotifers were generally the dominant group of organisms. Only the Upper Warrior Lake showed variation from this trend, having copepod nauplii and adults as a major contributor in June and July 1979. Maximum numbers of zooplankton were recorded in June 1979, especially in Lower Warrior Lake (600/liter), the Lower Black Warrior River (700/liter) and Demopolis Lake (450/liter). Upper Warrior Lake and the Tombigbee River did not exhibit these large numbers in June 1974 but had only moderate total numbers (200-300/liter) which were comparable with numbers observed throughout the warm months. All stations experienced a decline in total numbers in July 1979 (e.g. Lower Warrior Lake dropped from 600/liter to approximately 150/liter),

FIGURE 3-2. Community Composition and Total Numbers of Zooplankton in Major River Sections, Middle Black Warrior and Tombigbee Rivers, July 1978 and October 1979



although rotifers remained the predominant organism. Throughout the remainder of the study, rotifers dominated the collections although copepods began to increase in most sections in August 1979 while cladocerans had a 1979 peak (30% contribution) in Demopolis Lake during August 1979. In all cases, rotifers were the spring to fall dominant in all river sections in 1979 with the average contribution being approximately 90%.

The dominance of the rotifers in percentage contribution was reflected in the analysis of dominant species (defined as the two most numerically abundant species at each station during each collection). Fully 70% of organisms recorded as dominant were rotifers (Table 3-27) with *Keratella cochlearis* et spp. being dominant at 18% of all samples collected. *Conochilus unicornis*, a ubiquitous rotifer, was dominant in 15% of the samples. The only non-rotifer contributing more than 5% dominants to the total study was the cladoceran *Bosmina longirostris*, with 12% total dominance. Three protozoans, *Ceratium hirudinella, Epistylus nigare* and *Vorticella* sp., were occasional dominants, as were the copepods *Cyclops spp* and *Diaptomus spp*. Rotifera was the most abundant phylum with the Cladocera, Copepods and Protozoa following in rank order.

In summary, zooplankton populations evidenced summer maxima and winter minima with rotifers comprising both the greatest number of taxa encountered and the highest levels of dominance, both by percent contribution and numerical abundance. The cladocerans, especially *Bosmina longirostris*, were frequently abundant in mid-summer while copepods showed high percentages in community contribution in the late fall and winter months. As with phytoplankton (see Section 3.?.2), a marked change was noted in spring 1979 (May) when the percentage of rotifers far exceeded the community contribution of the Rotifera in 1978. In but a few instances, the contribution of the Crustacea was quite low during all of 1979.

3.2.4 Macroinvertebrates

3.2.4.1 Benthic Macroinvertebrates, Ponar Dredge

Collections of benthic macroinvertebrates were made at three points of the river cross section at each station. The results of these collections and the averages and calculated indices are found tabulated in Appendix N. The summarization of this section presents a listing of taxa identified and river section versus date data for community composition, total numbers and Shannon-Weaver diversity.

Table 3-28 is a complete listing of all benthic macroinvertebrates collected by Ponar dredge during the study. Class Insecta provided the greatest number of species with Chironomidae (chironomids, the midgeflies) having the greatest number of taxa (genera) of any family. Other insect groups, rank ordered by number of taxa in each, are the Ephemeroptera (mayflies), the Trichoptera (caddisflies), Coleoptera (beetles), Odonata (dragon and damselflies), Plecoptera (stoneflies) and Megaloptera (fishflies). Many other phyla and classes were represented. Of these, many were of only occasional occurrence. For this reason, many organisms were of only minor importance to the community structure. To facilitate interpretation of data, many of the less prevalent taxa have been grouped together.

TABLE 3-27. **Number of Occurrances as One of the Top Two Dominant Zooplankton Taxa by Sampling Trip, Middle Black Warrior and Tombigbee Rivers, July 1978 thru October 1979**

Species Occurring as One of the Two Most Numerically Abundant	July 30 - Aug. 4 1978	Aug. 27 - Sept. 1 1978	Oct. 1 - Oct. 5 1978	Dec. 1978	Feb. 28 - March 2 1979	April 13 - April 16 1979	June 17 - June 20 1979	July 29 - Aug. 1 1979	Aug. 26 - Aug. 29 1979	Oct. 1 - Oct. 3 1979	
	1	2	3	4	5	6	7	8	9	10	Σ
Keretella cochlearis et. sp.	6*	1	2		2	6	18	11	15	18	79
Conochilus unicornis et. sp.			10	5							
Polyarthra trigla	6	2	2	6	3	15	13	3	12		62
Bosmina longirostris	2	7	13	15	9	5				1	52
Sychaeta stylata						13	5	8	1	5	32
Brachionuc calyciflorus et. spp.	12	11			2						25
Synchaeta pectinata					16						16
Diaphanosoma brachyurum	3	2	1	1				1	6	1	15
Conochilus hippocrepis et. sp.		13									13
Ceratium hirudinella				4		3	3				10
Conochilus dossaurus et. sp.	10										10
Conochiloides exiguus			3	4					1		8
Diaptomus spp.		2	2	1				3			8
Enteroplea lacustris			3	5							8
Hexarthra mira		2	4								6
Brachionus angularis et. spp.			4		1						5
Filinia longiseta					4						4
Brachionus spp.	1	1			1						3
Asplancha priodonta					2						2
Brachionus caudatus et. spp.								2			2
Cyclops spp.				1	1						2
Kellicottia longispina				1	1						2
Ceriodaphnia lacustris									1		1
Epistylus nigara										1	1
Notholca accuminatus					1						1
Pleosoma spp.								1			1
Vorticella sp.										1	1

* Values represent the total number of stations, on the given date, at which the species was one of the two most abundant species.

Table 3-28. Phylogenetic Listing of Macroinvertebrate Taxa. Collected by Ponar Dredge, Middle Black Warrior and Tombigbee Rivers, July 1978 through October 1979.

PHYLUM COELENTERATA
CLASS HYDROZOA
ORDER HYDROIDA
Family Hydridae
Hydra
PHYLUM PLATYHELMINTHES
CLASS TURBELLARIA
PHYLUM NEMERTEA
Prostoma rubrum
PHYLUM NEMATODA (nematodes)
CLASS ADENOPHOREA
PHYLUM BROYOZOA
PHYLUM MOLLUSCA
CLASS PELECYPODA
ORDER HETERODONTA
Family Corbiculidea
Corbicula manilensis
Family Unionidae
Tritigonia verrucosa
Obliquaria reflexa
CLASS GASTROPODA
ORDER BASOMMATOPHERA
Family Ancylidae
Laevapex
Family Physidae
Physa
Family Planorbidae
Gyraulus
Family Bulmidae
Birgella subglobosa
Clappia
Phyrgulopsis
Family Plueroceridae
Goniobasis
Pluerocera
Family Vivaparidae
Campeloma

TABLE 3-28. (continued)

PHYLUM ANNELIDA
CLASS OLIGOCHAETA
ORDER HAPLOTAXIDA
Family Naididae
Family Tubificidae
CLASS HIRUDINEA
PHYLUM ARTHROPODA
CLASS CRUSTACEA
ORDER CLADOCERA (water flies)
Family Daphnidae
Ceriodaphnia
Daphnia
Family Holopediadae
Holopedium amazonicum
Family Macrothricidae
Ilyocryptus spinifer
Family Sididae
Sida crystallina
ORDER COPEPODA (copepods)
SUBORDER CALANOIDA
Family Diaptomidae
Diaptomus
SUBORDER CYCLOPOIDA
ORDER OSTRACODA (seed shrimp)
ORDER AMPHIPODA
Family Gammeridae
Crangonyx
Family Talitridae
Hyalella azteca
ORDER ISOPODA (isopads)
Family Asellidae
Asellus
Lirceus
CLASS ARACHNIDA
ORDER ACARINA (mites)
Family Unionicolidae
Unionicola
CLASS INSECTA
ORDER EPHEMEROPTERA
Family Baetidae
Baetis
Family Caenidae
Caenis
Family Ephemeridae
Hexagenia
Pentagenia
Family Heptageniidae
Stenonema

TABLE 3-28. (continued)

Family Tricorythidae
Tricorythodes
Family Polymitarcyide
Tortopus incertus
ORDER ODONATA
SUBORDER ZYGOPTERA
Family Coenagriidae
Argia
SUBORDER ANISOPTERA
Family Gomphidae
Gomphus
Dromogomphus
Family Macromiiade
Macromia
ORDER PLECOPTERA
Family Perlidae
Neoperla cylmeue
ORDER MEGALOPTERA
Family Sialidae
Sialis
ORDER COLEOPTERA
Family Elmidae
Berosus
Dubiraphia
Ordobrevia
Stenelmis
ORDER TRICHOPTERA
Family Hydropsychidae
Hydropsyche
Chuematopsyche
Potamyia
Family Psychomiidae
Cyrnellus
Family Leptoceridae
Olcetis
ORDER DIPTERA (flies, general)
Family Dolichopidae
Family Empidae
Family Culicidae
Subfamily Chaoborinae (phantom midges)
Chaoborus
Family Ceratopogonidae (biting midges)
Family Simulidae
Simulium

TABLE 3-28. (continued)

Family Chironomidae

Ablabesmyia
Chironomus
Cladotanytarsus
Coelotanypus
Cricotopus
Cryptochironomus
Crypototendipes
Dicrotendipes
Einfeldia
Epoicocladius
Glyptotendipes
Harnischia
Labrundinia
Micropsectra
Orthocladius
Parachironomus
Paracladopelma
Paratendipes
Pentaneura
Phaenospectra
Polypedilum
Procladius
Psectrocladius
Rheotanytarsus
Stempellina
Stenochironomus
Stictochironomus
Tanypus
Tanytarsus
Tribelos
Xenochironomus

Figure 3-3 presents a graphic representation of the major benthic macroinvertebrate groups as they comprised the benthic community. Additionally, the graph displays total numbers of benthic macroinvertebrates during each month. In most collections the Oligochaeta comprised >50% of the total community structure. However, several exceptions are noted. The Warrior Lake was frequently dominated by *Corbicula manilensis*. This was the case during the summer of both 1978 (July 1978, Table N-1) and 1979 (August 1979, Table N-6). In the 1978 collection, many clams were large but during 1979 all clams were less than 0.5 cm in diameter (see tables given above). Lower Warrior Lake also had moderate numbers of *Corbicula*, with the average percentage contribution being about half that of Upper Warrior Lake (Figure 3-3). The Lower Warrior Lake clams were generally larger than those found in Upper Warrior Lake as evidenced by biomass estimations (Table 3-4). The group listed as "All others" in Figure 3-3 was generally comprised of mayflies and caddisflies. This group was an occasional majority of the benthos. The Tombigbee River and Demopolis Lake had the highest overall contributions of this grouping. The Tombigbee River was 90% "others" in July 1978 of which 75% was contributed by *Chaborus* and 25% by the mayfly *Hexagenia* (Table N-1). Another peak of "others" occurred in the Tombigbee River in August 1979 was also contributed by the mayflies (Table N-6). Mayflies, especially large *Hexagenia*, were also responsible for the parallel peaks in Demopolis Lake (Table N-1 and N-6). The chironomids were a ubiquitos and evenly dispersed group, occurring in all sections as at least 10-25% of the benthos.

Trends of total numbers (Figure 3-3) and biomass (Figure 3-4) show very similar patterns. A maxima occurred in December 1978 for all Black Warrior River sections with Lower Warrior Lake having the highest average total number of benthos, $350/m^2$ (Figure 3-4). The highest non-*Corbicula* biomass occurred in Lower Warrior Lake in July 1978, 16 g/m^2, and was largely comprised of large *Hexagenia*. All sections, except Demopolis Lake, experienced a sharp decline in numbers and biomass during May 1979. The high biomass in Demopolis Lakes during that month was predominantly *Hexagenia* in conjunction with the chironomids (Table N-3). During the summer month of 1979, a total number of benthos increased steadily, reaching a maximum in all sections in August. Biomass values however, were low (>5.0 g/m^2) throughout this time. In general, however, Warrior and Demopolis Lakes had the highest total numbers and highest average biomasses of any of the river sections.

Shannon-Weaver diversity values ($\bar{d}$) are given, along with section, monthly and study period averages in Table 3-29. Generally, all stations showed $\bar{d}$ values in the range defined by most workers as indicative of "intermediate water quality" (Mason, Lewis and Hudson, 1975). Although slight fluctuations in average values for the river sections are present (1.75 to 2.35), the basic pattern of benthos diversity is not varied from river section to river section. The major noticeable trend across the months is the distinct drop in $\bar{d}$ levels between December 1978 and May 1979 in all sections (May 1979 had the lowest average $\bar{d}$ during the study).

In summary, the Middle Black Warrior and Tombigbee River system benthos is comprised chiefly of insects and oligochaetes and shows wide seasonal variations of benthic biomass. Lower Warrior Lake and Demopolis Lake had the highest total numbers and biomass values.

Figure 3-3. Percentage Contribution of Selected Taxa and Total Numbers of Benthic Macroinvertebrates, Middle Black Warrior and Tombigbee Rivers, July 1978 thru October 1979

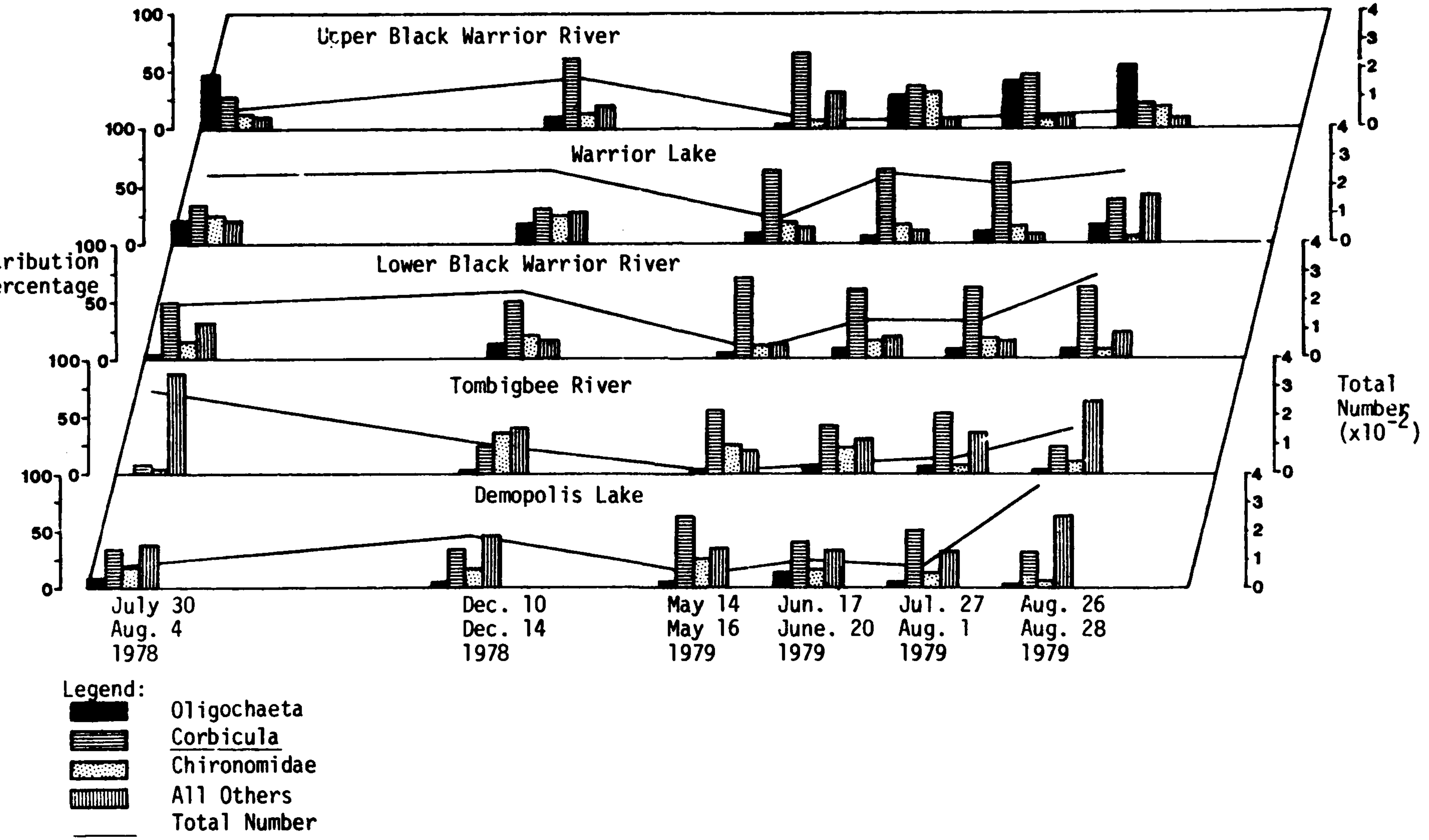
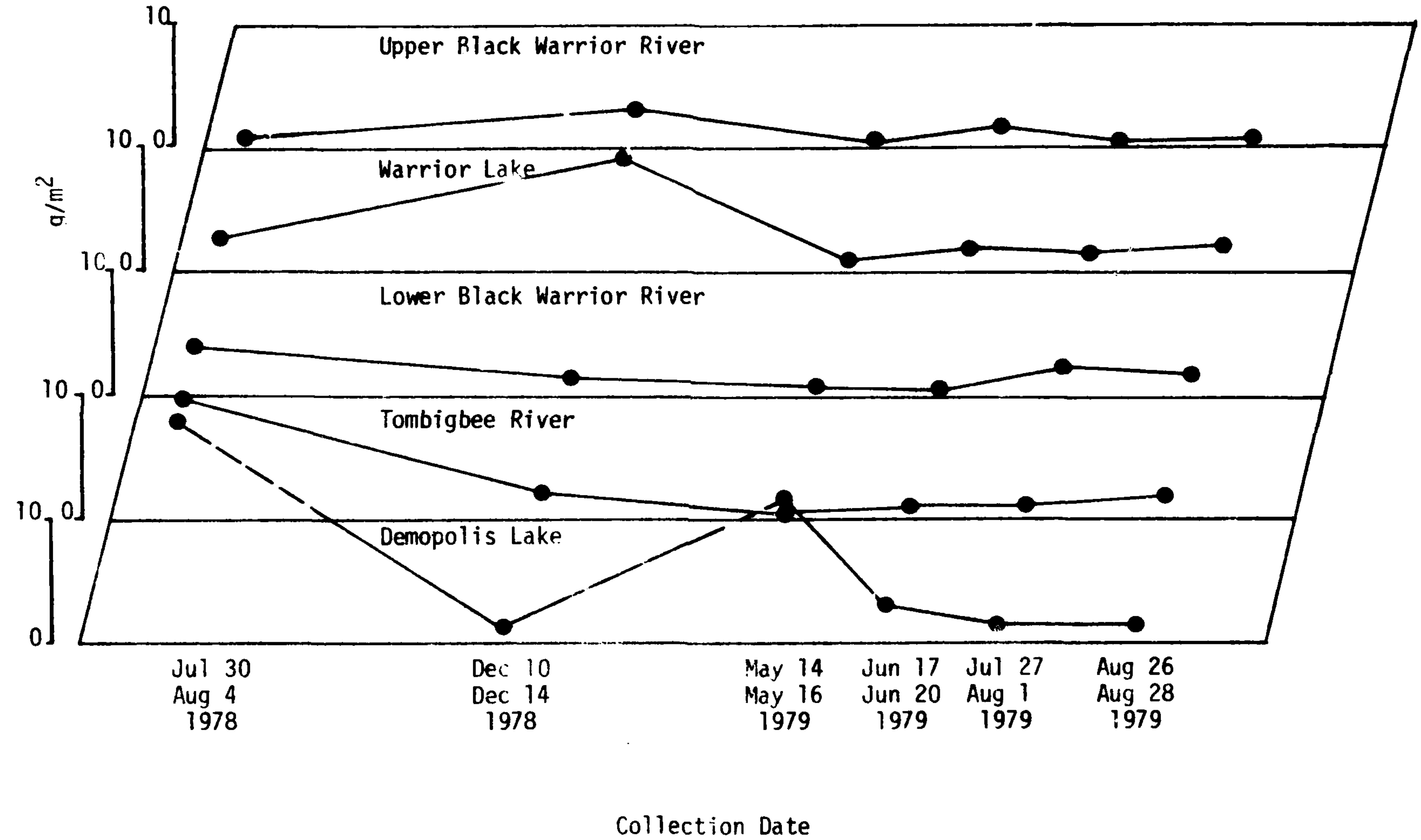


Figure 3-4. Benthic Macroinvertebrate biomass (grams/m^2) from Ponar Collections, Middle Black Warrior and Tombigbee River, July 1978 through August 1979.



Shannon-Weaver diversity indicies indicated, on the average, that both river basins were moderately polluted and had only slightly varying species diversity. Overall, the river basins have an abundance of benthic organisms which comprise the basis of the food chain leading to good fish production in the study area.

3.2.4.2 Macroinvertebrates, Multiple Plate Samplers

Multiple plate samplers (MPS) were positioned at selected stations during four sampling periods. At several collection dates (see Appendix O) some samplers were not recovered due to loss by vandalism, high water or other means. Results of these collections are found in Appendix O. Table 3-30 presents the taxa of macroinvertebrates identified from multiple plate samplers.

The overwhelming majority of invertebrates collected by MPS were chironomids. Approximately 30% fewer genera were encountered on the MPS than in the benthos collections. August 1978 had very high total numbers of organisms (2000-6000/m^2) which were 20% caddisflies (represented by *Cyrnellus*) and 70-75% chironomids (Table O-1). The February 1979 collection evidenced a marked decrease in total numbers (540-850/m^2) although chironomids continued to comprise $\geq$75% of the community (Table O-2). Summer 1979 samples showed a return to the levels seen in July 1978. The community structure became more balanced with caddisflies and chironomids each comprising about 40% of the collected organisms (see Tables O-3 and O-4). Diversity indices ($\bar{d}$) for MPS were very similar to those for Ponar samples, with a classification of "intermediate water quality" (see Section 3.2.4.1). In contrast to Ponar samples, neither community structure nor diversity showed much difference between river basins. Thus, MPS, in many respects corroborated trends observed for benthic macroinvertebrates, especially seasonal trends. However, community structures varied significantly, with chironomids being the dominant MPS taxa.

3.2.5 Algal Growth Potential

Algal growth potential (AGP) tests were conducted three times during the study period. The results of the individual cell counts and chemical analyses are found in Appendix P. Figure 3-5 summarizes the results.

The results of AGP testing showed wide variation between the actual algal production values for the three tests. However, the treatments to which the algae responded were generally the same during each test. P N and EDTA + P+N generally gave the highest cell production values. N, EDTA and EDTA+N generally produced values in the range of the control treatments. P gave the highest values of any single nutrient.

There are some station by station variations. R-2 had the lowest cell production levels during each test with EDTA+P+N generally producing the highest levels at that station. Another trend at R-2 is the increase in cell production during each sampling trip. All Black Warrior River stations had approixmately equal cell productions in the individual tests with P+N giving the highest results. R-17 produced the highest numbers of cells during October 1978 and especially August 1979. (It should be noted that the May 1979 results were very low for all stations.) The complete treatment, EDTA+P+N, produced the greatest number of cells at R-17. R-21 results

Table 3-29. Summary of Shannon-Weaver Diversity ($\bar{d}$) values for Macroinvertebrates Collected by Ponar Dredge, Middle Black Warrior and Tombigbee Rivers, July 1978 thru August 1979

SECTION	STATION	JULY 1978	DECEMBER 1978	MAY 1979	JUNE 1979	JULY 1979	AUGUST 1979	$\bar{x}$
UPPER WARRIOR LAKE	R-1	1.99	2.35	1.78	1.73	2.37	2.70	2.15
	R-2	2.48	1.32	0.71	1.95	1.10	1.03	1.43
	R-3	2.50	1.54	1.68	2.74	1.69	2.88	2.17
	R-4	1.96	0.60	1.38	1.32	0.63	2.24	1.36
	R-5	1.48	2.63	0.98	2.47	1.74	0.54	1.64
	$\bar{x}$	2.08	1.49	1.31	2.04	1.51	1.88	1.75
WARRIOR LAKE	R-6	2.51	3.26	1.12	1.54	2.81	2.04	2.21
	R-7	2.35	2.80	1.78	2.31	1.91	2.63	2.30
	R-8	2.32	3.29	2.51	2.87	2.12	2.93	2.82
	R-9	2.39	2.48	1.86	2.31	1.33	2.32	2.12
	R-10	2.12	2.96	0.66	2.71	2.04	2.33	2.14
	$\bar{x}$	2.34	2.96	1.59	2.35	2.04	2.45	2.32
LOWER BLACK WARRIOR RIVER	R-12	3.03	2.74	1.37	2.65	1.72	2.50	2.34
	R-13	1.95	2.65	2.41	2.72	2.48	1.62	2.31
	R-14	1.67	2.69	1.10	3.04	3.20	2.25	2.33
	R-15	1.95	2.39	1.25	1.87	2.03	1.97	1.91
	R-16	2.60	2.95	1.77	1.74	2.87	2.20	2.36
	$\bar{x}$	2.24	2.68	1.58	2.40	2.46	2.11	2.25
TOMBIGBEE RIVER	R-17	1.00	3.01	---	2.98	2.62	3.44	2.61
	R-18	2.67	2.29	2.01	2.79	2.64	2.44	2.47
	R-19	0.49	1.92	3.65	3.35	2.27	2.68	2.39
	R-20	1.57	2.93	1.10	3.31	2.66	2.47	2.34
	R-21	1.01	3.19	2.26	2.08	1.05	2.19	1.96
	$\bar{x}$	1.35	2.87	2.26	2.90	2.25	2.64	2.35
DEMOPOLIS LAKE	R-22	2.53	2.78	2.76	3.50	2.60	1.95	2.69
	R-23	2.67	2.07	1.54	1.47	1.92	1.30	1.83
	$\bar{x}$	2.60	2.43	2.15	2.49	2.26	1.63	2.26
	Trip $\bar{x}$	2.12	2.49	1.78	2.44	2.10	2.14	---

Table 3-30. Phylogenetic Listing of Macroinvertebrate Taxa Collected by Multiple Plate Sampler, Middle Black Warrior and Tombigbee Rivers, July 1978 through October 1979.

PHYLUM COELENTERATA
  CLASS HYDROZOA
    ORDER HYDROIDA
      Family Hydridae
        Hydra
  CLASS TURBELLARIA
PHYLUM NEMERTEA
        Prostoma rubrum
PHYLUM NEMATODA (nematodes)
  CLASS ADENOPHOREA
PHYLUM BRYOZOA
PHYLUM MOLLUSCA
  CLASS PELECYPODA
    ORDER HETERODONTA
      Family Corticulidae
        Corbicula manilensis
  CLASS GASTROPODA
    ORDER BASOMMATOPHERA
      Family Ancylidae
        Laevapex
      Family Physidae
        Physa
      Family Planorbidae
        Gyraulus
      Family Plueroceridae
        Pluerocera
PHYLUM ANNELIDA
  CLASS OLIGOCHAETA
    ORDER HAPLOTAXIDA
      Family Naididae
      Family Tubificiade
PHYLUM ARTHROPODA
  CLASS CRUSTACEA
    ORDER CLADOCERA
      Family Daphnidae
        Ceriodaphnia
        Daphnia

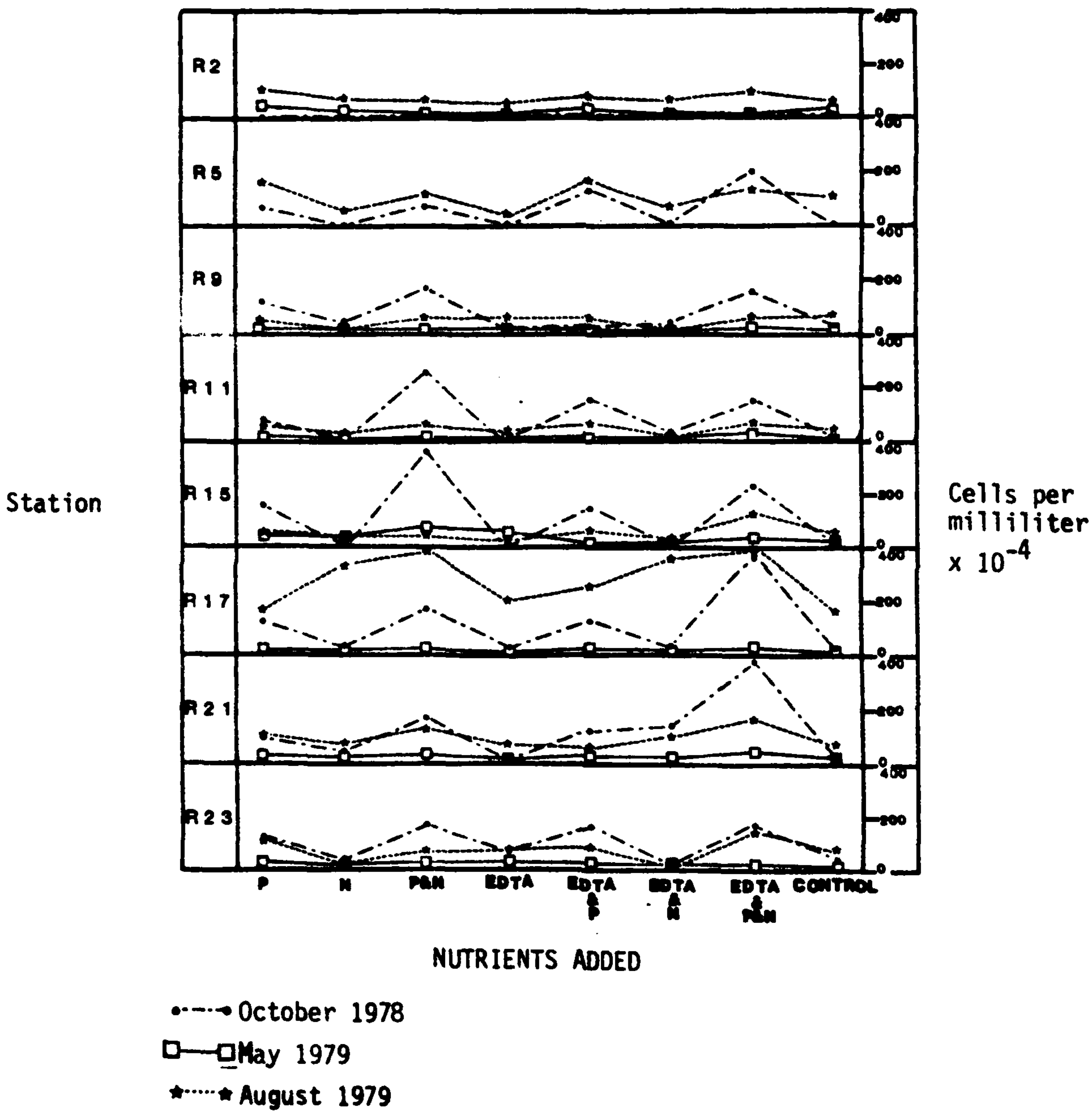
TABLE 3-30. (continued)

Family Sididae
Diaphanosoma brachyarum
Sida crystallina
ORDER COPEPODA
SUBORDER CALANOIDA
Family Diaptomidae
Diaptomus
SUBORDER CYCLOPOIDA
ORDER OSTRACODA
ORDER AMPHIPODA
Family Gammeridae
Gammarus
Family Talitridae
Hyalella azteca
ORDER ISOPODA (isopods)
Family Asellidae
Asellus
CLASS ARACHNIDA
ORDER ACARINA
Family Unioncolidae
Unionicola
CLASS INSECTA
ORDER EPHEMEROPTERA
Family Baetidae
Baetis
Family Caenidae
Caenis
Family Heptageniidae
Heptagenia
Stenonema
Family Tricorythidae
Tricorythodes
ORDER ODONATA
SUBORDER ZYGOPTERA
Family Coenagriidae
Argia
SUBORDER ANISOPTERA
Family Gomphidae
Dromogomphus
Family Libellutidae
Nuerocordalia
Family Macromiidae
Macromia

TABLE 3-30. (continued)

ORDER PLECOPTERA
Family Perlidae
Acronoeuria
Family Nemouridae
Prostoia
ORDER COLEOPTERA
Family Elmidae
Stenelmis
ORDER TRICHOPTERA
Family Hydropsychidae
Hydropsyche
Chuematopsyche
Potamyia
Family Psychomiidae
Cyrnellus
Family Leptoceridae
Olcertis
Family Hydroptilidae
Agraylea
Hydroptila
ORDER DIPTERA
Family Empidae
Family Culicidae
Subfamily Chaoborinae
Chaoborus
Family Ceratopogonidae
Family Simulidae
Simulium
Family Chironomidae
Ablabesmyia
Chironomus
Cricotopus
Cryptochironomus
Dicrotendipes
Einfeldia
Endochironomus
Eukifferella
Glyptotendipes
Micropsectra
Orthocladius
Parachironomus
Pentaneura
Phaenospectra
Polypedilum
Procladius
Psectrocladius
Psuedochironomus
Rheotanytarus
Stenochironomus
Tanytarsus
Thienemanniella
Tribelos

FIGURE 3-5. Results of Algal Growth Potential (AGP) Tests, Middle Black Warrior and Tombigbee Rivers, 1978 and 1979



were similar to R-17, with slightly reduced cell production values for August 1979. At R-23 the results looked quite similar to the Black Warrior River results.

Thus, AGP test results indicate general phosphorus limitation for both basins. Nitrogen and EDTA additions were seen to increase production even further.

3.2.6 Aquatic Macrophyte Distribution

The results of the September, 1978, and August 1979, surveys of aquatic macrophytes are presented in Appendix Q. The tabulated data in this section includes alphabetical lists of all plants observed during each survey and a seperate tabulation of the most abundant species and the other plants at each locality. For the purposes of the data presentation the study area has been sub-divided into three sections: Warrior Lake (R-1 thru R-9), the Lower Black Warrior River (R-10 thru R-16) and the Tombigbee River and Lake Demopolis (R-17 thru R-23).

Table 3-31 presents a complete listing of all the taxa observed and reported as aquatic macrophytes. Among these, only a few would be considered true aquatic macrophytes. These would be cattails (*Typha*), hornwart (*Chara*), sedges, rushes, giant cutgrass (*Zizaniopsis milacea*), alligator weed (*Alternanthera philoxeroides*) and water willow (*Justica americana*) and coon-tail (*Ceratophyllum*). Many of the other listed plants (e.g. *Sagittaria, Hisbiscus* and *Taxodium*) are shoreline and wet area associates. The remaining species are those plants found growing along the shoreline, on sandbars and along the sides of sloughs and creeks. The listing in Table 3-31 has re-organized into the alphabetical listing and location tables presented in Appendix Q.

The alphabetical listings of plants observed (Tables Q-1, Q-3, Q-5, Q-7, Q-9 and Q-11) indicate that approximately the same species were observed each year. The major variation between the two observations is the inclusion of several more shoreline associates (e.g. alder, river cane) during 1979. This is attributed to two factors. The first is the experience of the investigator in searching likely areas (sloughs, for example) which contribute more species. The second is the variation in water levels of the reservoirs during the two surveys. Thus, the alphabetical lists provide a reference for the location lists (Q-2, Q-4, Q-6, Q-8, Q-10, and Q-12).

Aquatic macrophytes and associated plants occurred throughout the Black Warrior-Tombigbee basin. As can be seen on the location tables (Appendix Q) most macrophytes grew in patches or strips along the banks. These clumps were confined predominately to water less than five feet deep. Aquatic plants also grew well at creek and slough inlets, often forming dense barriers of matted surface growth. In general the aquatic macrophytes were isolated in these near-shore strips and posed no problem to general river traffic.

The location tables also show that the macrophytes were commonly found in "associations" with only rare cases of individual species occurring at single locations. By far the most common aquatic macrophytes, both by number of locations and number of times as the

TABLE 3-31. Taxanomic List of Aquatic Macrophytes Observed, Middle Black Warrior and Tombigbee Rivers, September 1978 and August 1979.

DIVISION CHLOROPHYTA
- CLASS CHLOROPHYCEAE
  - ORDER CHARALES
    - Family Characeae
      - Genus *Chara*

PHYLUM PTERIDOPHYTA
- Family Asnidaceae
  - Genus *Onoclea sensibilis*

PHYLUM SPERMATOPHYTA
- CLASS GYMNOSPERMAE
  - SUBCLASS MONOCOTYLEDONEAE
    - Family Taxodiaceae
      - Genus *Taxodium distichum*
- CLASS ANGIOSPERMAE
  - Family Thyphaceae (cattails)
    - Genus *Typha latifolia*
  - Family Alismataceae
    - Genera *Echinodorus cordifolius*
      - *Sagittaria montevidiensis*
      - *S. graminea*
      - *S. latifolia*
  - Family Poaceae (grasses)
    - Genera *Arundinaria gigantea*
      - *Eragrostis ciliarensis*
      - *E. hypnoides*
      - *E. glomerata*
      - *Leersia oryzoides*
      - *Zizaniopsis milacea*
      - *Echinochloa crusgalli*
      - *Paspalum* sp.
      - *Digitaria sanguinalis*
      - *Panicum agrostoides*
      - *P. dichotomiflorum*
      - *P. hemitomum*
      - *Erianthus strictus*
      - *E. giganteus*
      - *Tripsacum dactyloides*
  - Family Cyperaceae (sedges)
    - Genera *Cyperus polystachyos*
      - *C. odoratus*
      - *C. articulatus*
      - *C. erythrorhizos*
      - *C. iria*
      - *C. pseudovegetus*
      - *C. strigosus*
      - *Eleocharis obtusa*
      - *Fimbristylis autumnalis*
      - *F. miliacea*
      - *F. vahlii*
      - *Scirpus americanus*
      - *S. cyperinius*
      - *Rhynchospora corniculata*
      - *Carex joorii*

TABLE 3-31. Continued

Family Arecaceae
Genus *Sabal minor*
Family Lemnaceae
Genus *Spirodela oligorrhiza*
Family Commelinaceae
Genus *Commelina communis*
Family Pontideriaceae
Genus *Heteranthera reniformis*
Family Juncaceae
Genus *Juncus effusus*
SUBCLASS DILOTYLEDONEAE
Family Saururaceae
Genus *Saururus cernuus*
Family Salicaceae
Genus *Salix nigra*
Family Betulaceae
Genus *Alnus serrulata*
Family Urticaceae
Genus *Boehmeria cylindrica*
Family Polygonaceae
Genus *Polygonum pennsylvanicum*
P. lapathifolium
P. punctatum
Family Amaranthaceae
Genus *Alternanthera philoxeroides*
Family Aizoaceae
Genus *Mollugo verticillata*
Family Ceratophyllaceae
Genus *Ceratophyllum* sp. (unidentified)
Family Brassicaceae
Genus *Rorippa sessiliflora*
Family Saxifragaceae
Genus *Itea virginica*
Family Platanaceae
Genus *Platanus occidentalis*
Family Fabaceae
Genera *Cassia obtusifolia*
Sesbania exaltata
Glottidium vesicarium
Family Sapindaceae
Genus *Cardiospermum halicacabum*
Family Malvaceae
Genus *Hibiscus moscheutos*
H. militaris
Family Hypericaceae
Genus *Hypericum walteri*
H. sp. (unidentified)
Family Lythraceae
Genus *Ammannia coccinea*
Family Melastomataceae
Genus *Rhexia verginica*
Family Onagraceae
Genus *Ludwigia decurrens*
L. leptocarpa
L. peploides

TABLE 3-31. Continued

Genus *Ludwigia* (continued)
L. palustris
L. sp. (unidentified)
Family Apiaceae
Genus *Hydrocotyle verticillata*
Family Convolvulaceae
Genera *Cuscuta* sp. (unidentified)
Ipomea lacunosa
Family Hydrophyllaceae
Genus *Hydrolea quadrivalvis*
Family Boraginaceae
Genus *Heliotropium indicum*
Family Verbenaceae
Genus *Lippia lanceolata*
L. nodiflora
Family Solanaceae
Genus *Datura stramonium*
Family Scrophulariaceae
Genera *Bacopa repens*
Lindernia anagallidia
L. dubia
Family Acanthaceae
Genus *Justicia americana*
Family Rubiaceae
Genera *Cephalanthus occidentalis*
Diodia verginiana
Spermacoce glabra
Family Campanulaceae
Genera *Sphenoclea zeylandica*
Lobelia Cardinalis
Family Asteraceae
Genera *Xanthium strumarium*
Mikania scandens
Pluchea camphorata
Eclipta alba

most abundant at a location, were the giant cutgrass (*Zizanopsis milacea*), alligator weed (*Alternanthera philoxeroides*) and water willow (*Justica americana*). These plants, along with sedges, rushes, hornwart, coon-tail, arrowhead, grasses and the bald cypress, formed the majority of the observed aquatic macrophytes.

The two surveys, when reviewed as a composite, reveal the major distributions of aquatic macrophytes throughout the basin. As stated previously, the differences which arose between the two surveys originated with the experience of the investigator and the fluctuating water level of the reservoirs. Thus, in Warrior Lake, the 1978 survey showed only twenty-six (26) stands of aquatic macrophytes with alligator weed and giant cutgrass predominating (Table Q-2). The 1979 survey of the same reservoir resulted in location of one hundred two (102) stands of macrophytes. The primary difference arose from the definition of *Panicum agrostoides* and "Association I" (see Table Q-7) as a group of aquatic plants. The majority of the major aquatic macrophytes in Warrior Lake occurred between river miles 296 and 261 during both years (Tables Q-2 and Q-8).

Aquatic macrophyte occurrence in the Tombigbee River and Demopolis Lake was not similar to that observed in Warrior Lake. The Tombigbee River and Demopolis Lake macrophytes were most commonly dominated by stands of water willow (Tables Q-6 and Q-12). Giant cutgrass, alligator weed and marsh primrose were essentially absent from the Tombigbee River. Alligator weed began to show scattered distribution about river mile 231 (Tables Q-6 and Q-12) and continued to increase in abundance on into Demopolis Lake. Specific locations for alligator weed and giant cutgrass were quite similar during the 1978 and 1979 surveys. The habitats were littoral zones, creek mouths and sloughs, similar to the habitats occupied by these plants.

Figures 3-6 through 3-12 show the distributions of the major aquatic macrophytes discussed above. The location indicators (dots) should be taken to reference an observation of the listed species along that stretch of river. These figures should be compared to the location charts in Appendix Q for details on the exact location and areal extent. Further attention should be given to the plants associated with the major macrophytes given in the figures.

Figure 3-6 illustrates the distribution of alligator weed in the Middle Black Warrior-Tombigbee Basin. The plant is throughly scattered along the Black Warrior River, but is confined to Demopolis Lake and Rattlesnake Bend on the Tombigbee River. An isolated patch was observed near Epes, which may indicate the beginnings of upstream migration in the Tombigbee River. Giant cutgrass (Figure 3-7) showed the same general distribution as alligator weed, although the cutgrass had significant stands (see Appendix Q) as far upstream as Oliver Lock and Dam on the Black Warrior River.

The Tombigbee River had stands of water willow (Figure 3-8) extending much farther upstream than occurred on the Black Warrior River. However, both Warrior Lake and Demopolis Lake had the greatest concentration of water willow, with a less dense distribution being observed farther upstream.

Figure 3-6. Distribution of Alligator Weed (*Alternanthera philoxeroides*), Middle Black Warrior and Tombigbee Rivers, September 1978 and August 1979.

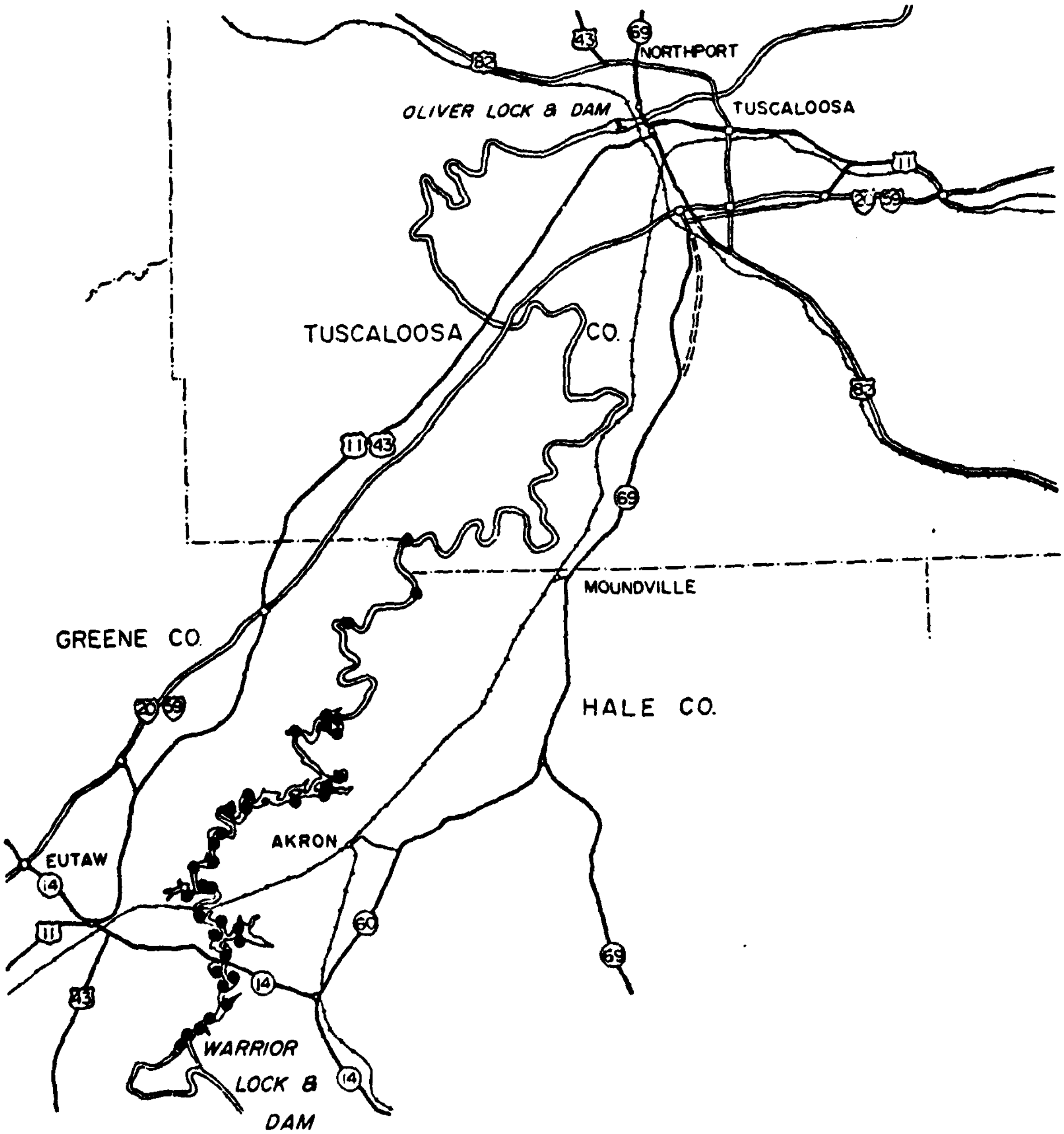


Figure 3-6. continued

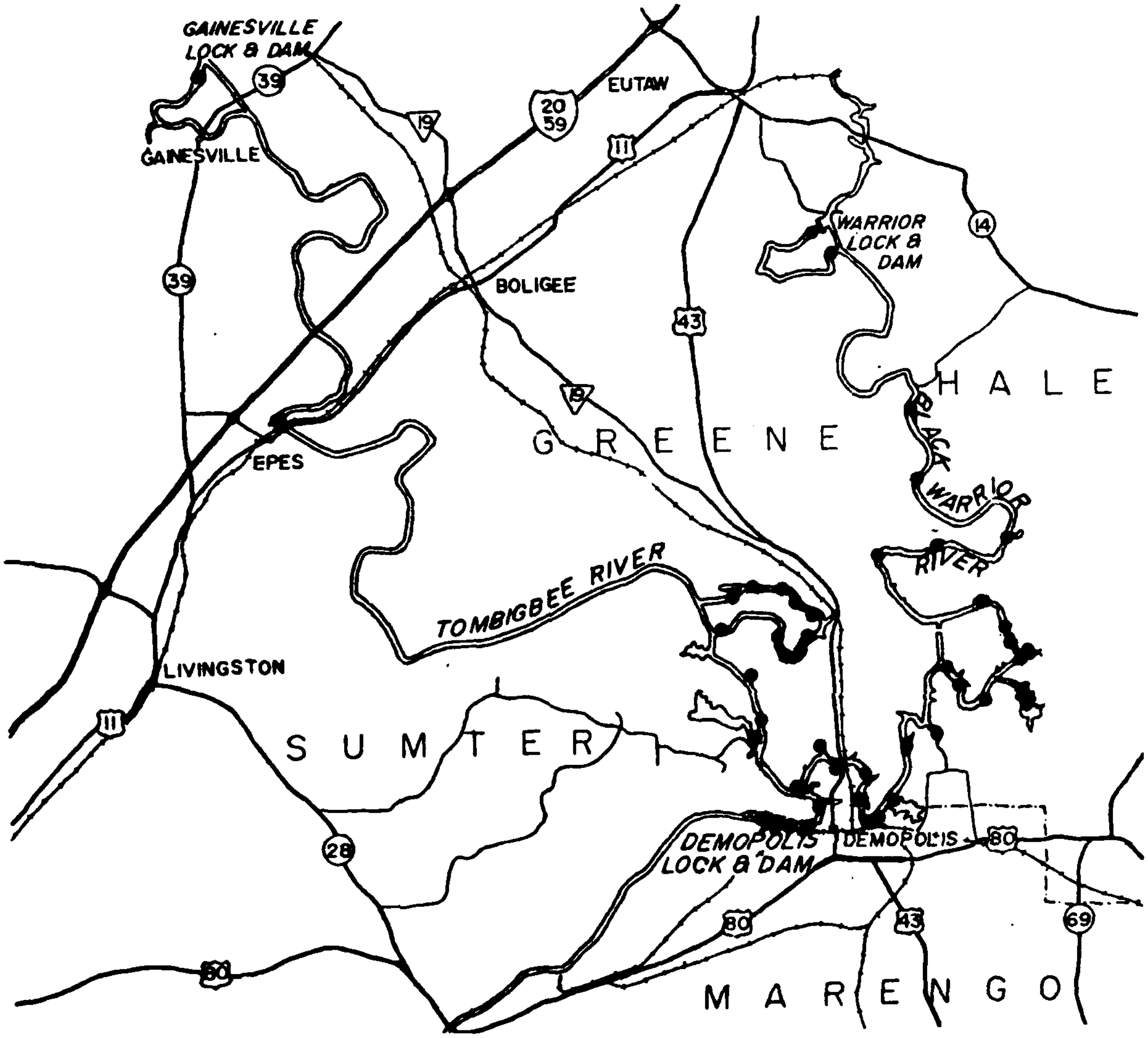


Figure 3-7. Distribution of Giant Cutgrass (*Zizaniopsis milacea*), Middle Black Warrior and Tombigbee Rivers, September 1978 and August 1979.

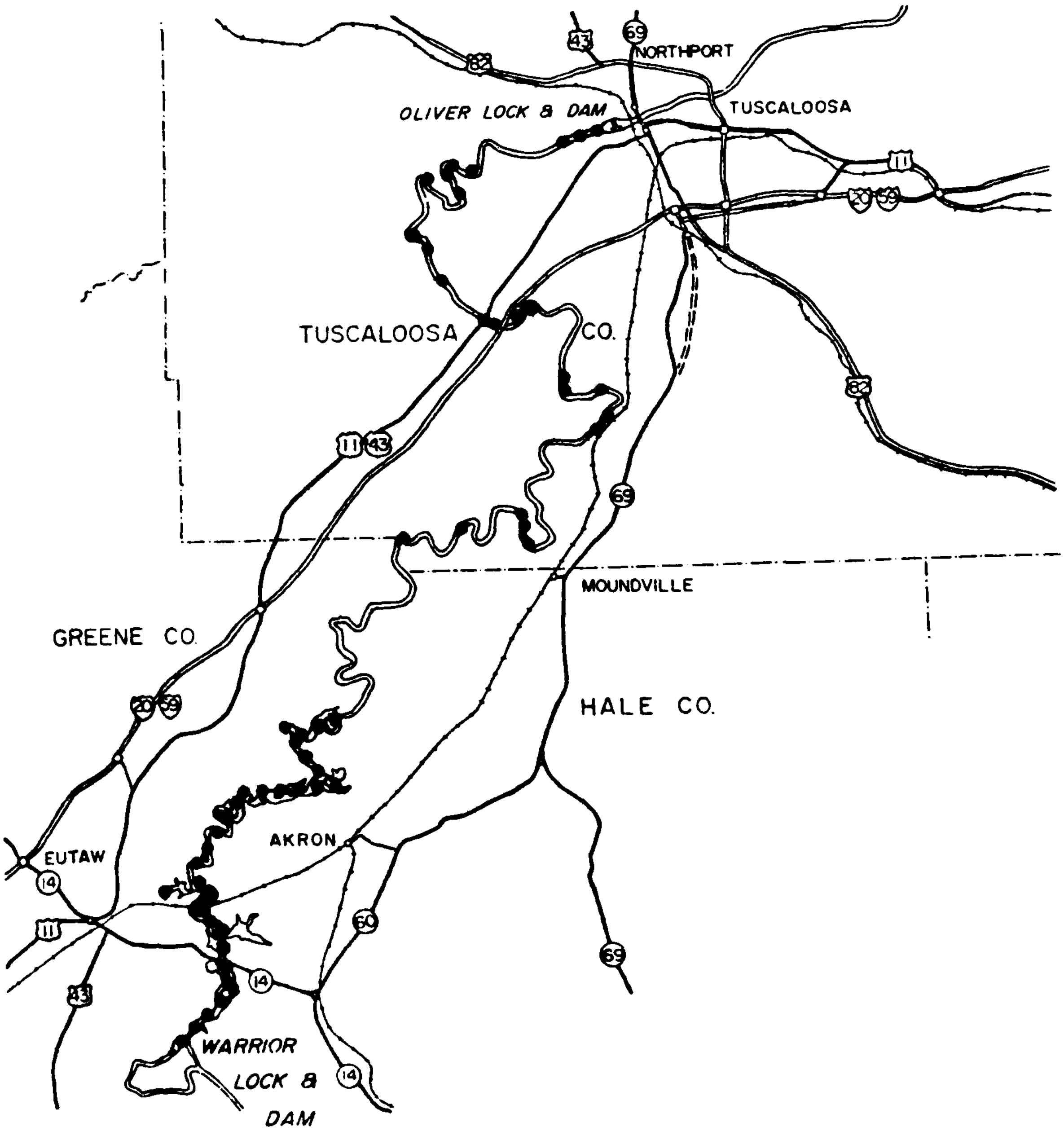


Figure 3-7. continued

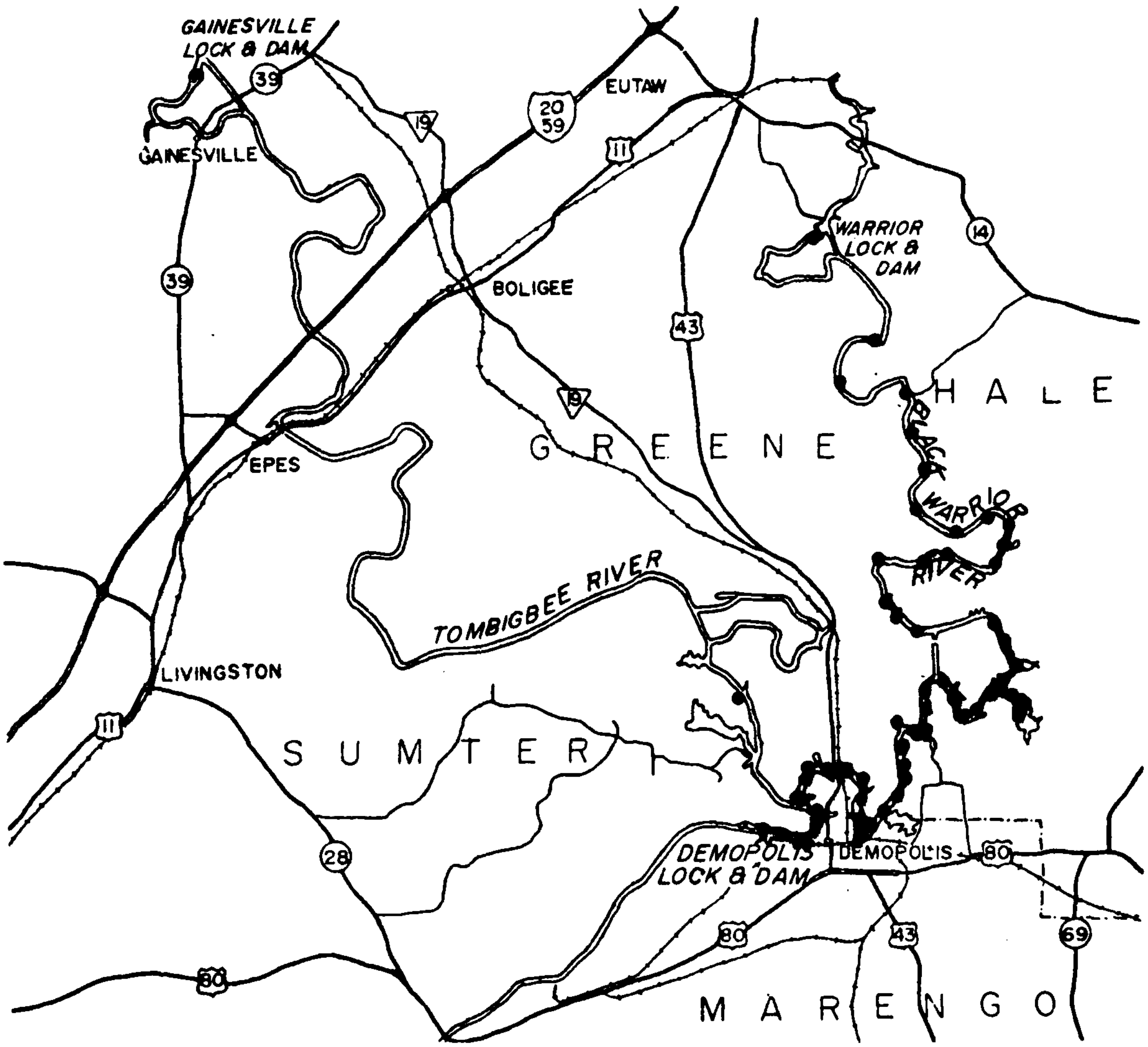


Figure 3-8. Locations of Water Willow (*Justica americana*), Middle Black Warrior and Tombigbee Rivers, September 1978 and August 1979

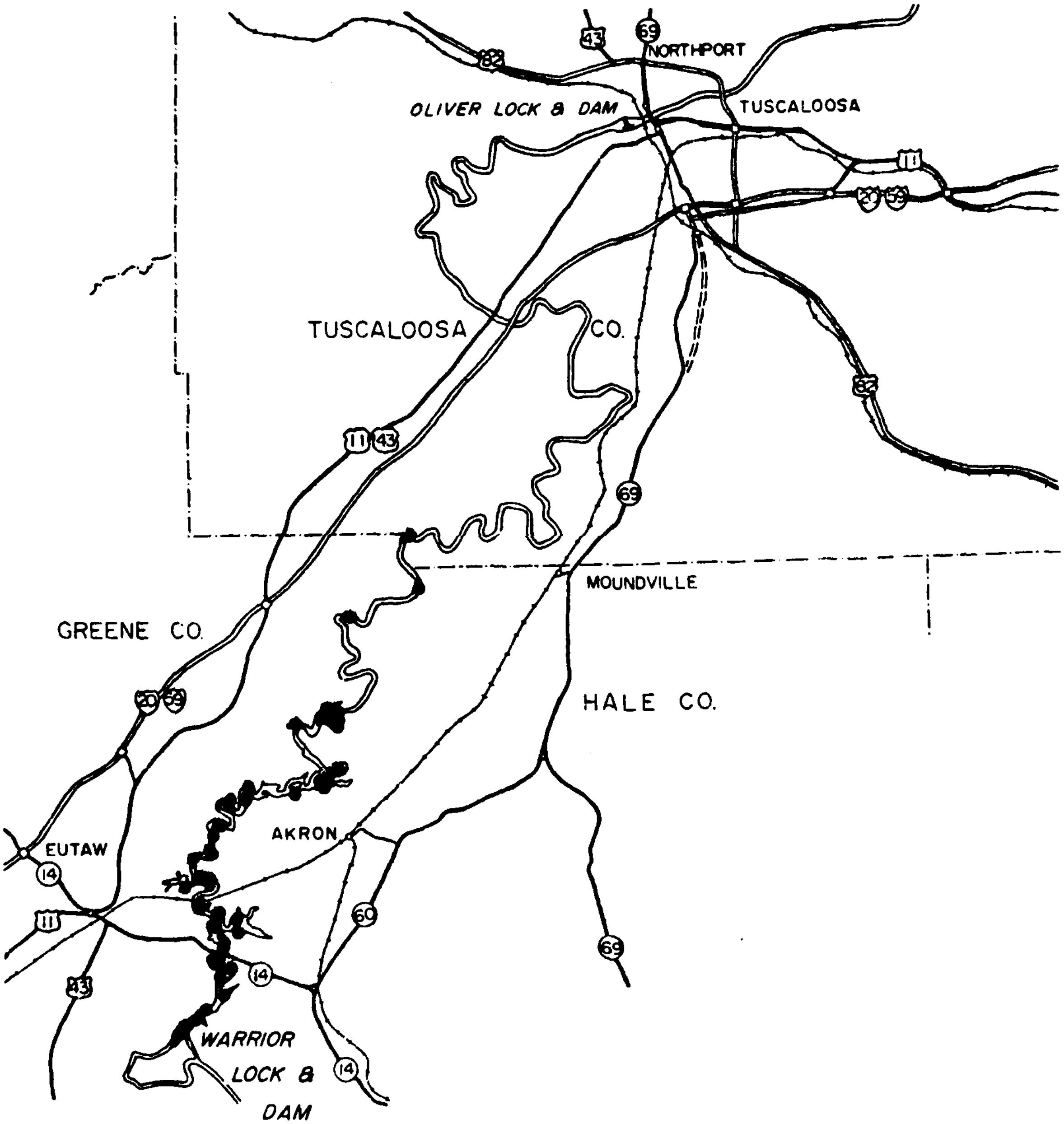
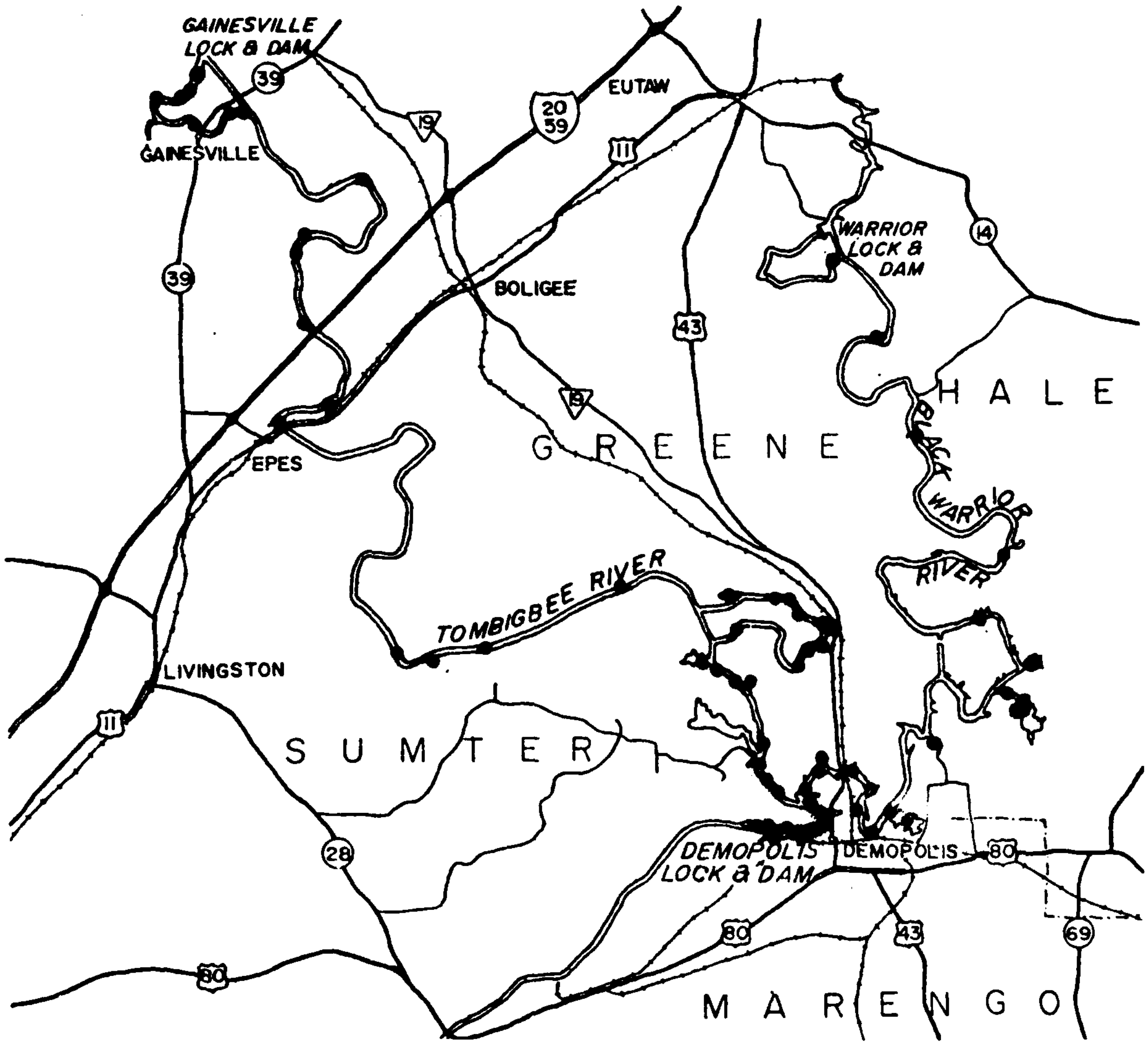


Figure 3-8. continued



Figures 3-9 through 3-12 show the locations of some of the aquatic macrophytes with limited distribution. Coon-tail (Figure 3-9) and hornwort (the macrophytic alga *Chara*, Figure 3-10) were restricted to Warrior Lake immediately upstream of the dam. Water primrose (Figure 3-11) showed some minor stands (see Appendix Q) throughout Warrior Lake. The *Panicum* grasses (Figure 3-12) were distributed in small patches (Appendix Q) along banks and sandbars throughout the Warrior River basin between the dam and Tuscaloosa.

In general, the aquatic macrophytes of the Middle Black Warrior and Tombigbee River basin were observed to be distributed throughout the study area. Most of the submerged and floating "water weeds" (e.g. alligator weed) were confined to banks, littoral zones, sloughs, embayments and creek mouths. Thus, no hazard to main river channel is posed by present plant growth. However, fishermen and sport boaters will often encounter floating mats and dense stands of alligator weed and water willow in the shallower portions of the rivers. This will be particularly true in such areas as creeks, sloughs and around or between islands (see Appendix Q).

Figure 3-9. Distribution of Coon-tail (*Ceratophyllum*), Middle Black Warrior and Tombigbee Rivers, September 1978 and August 1979.

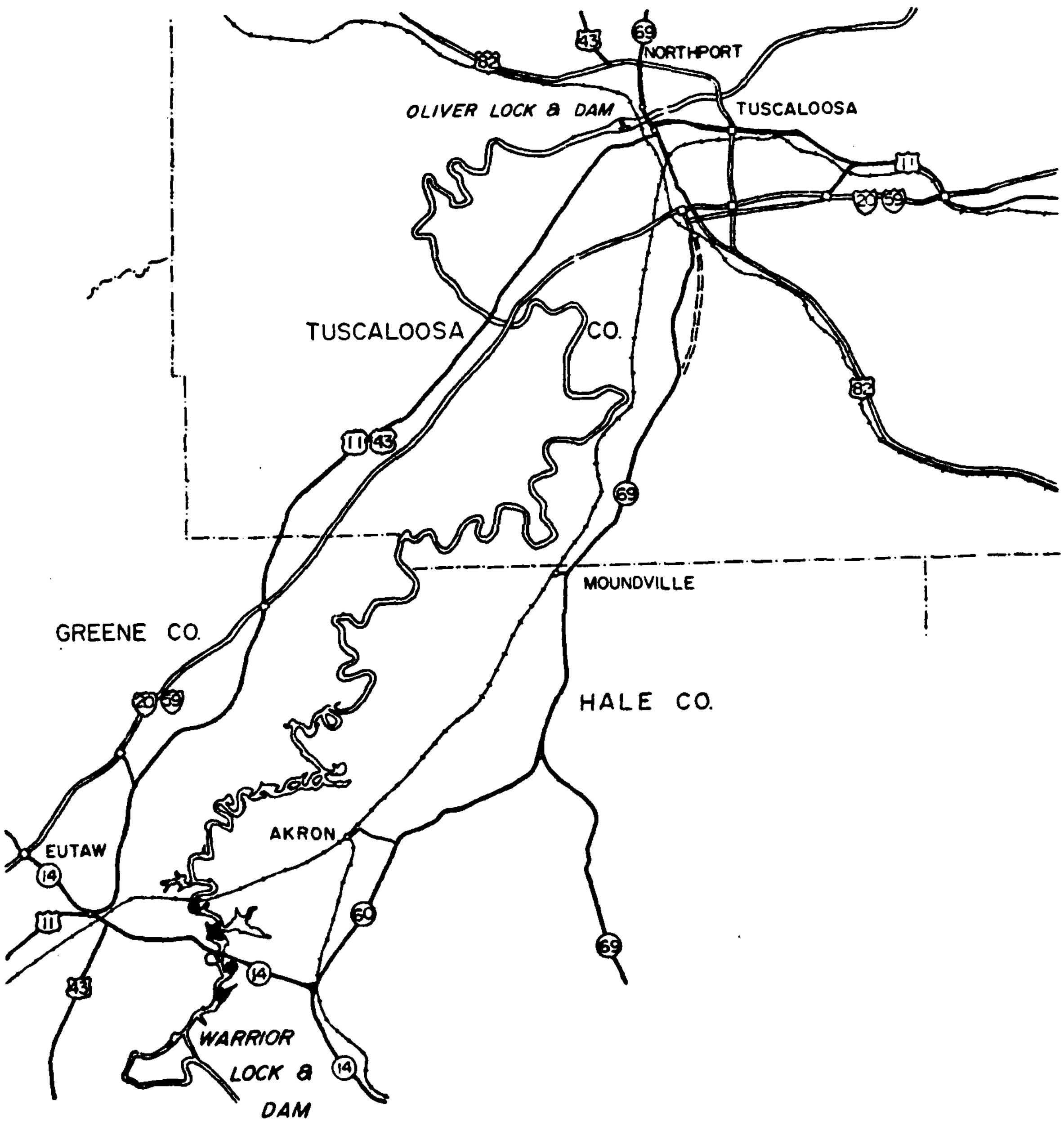


Figure 3-10. Distribution of Hornwort (*Chara*), Middle Black Warrior and Tombigbee Rivers, September 1978 and August 1979.

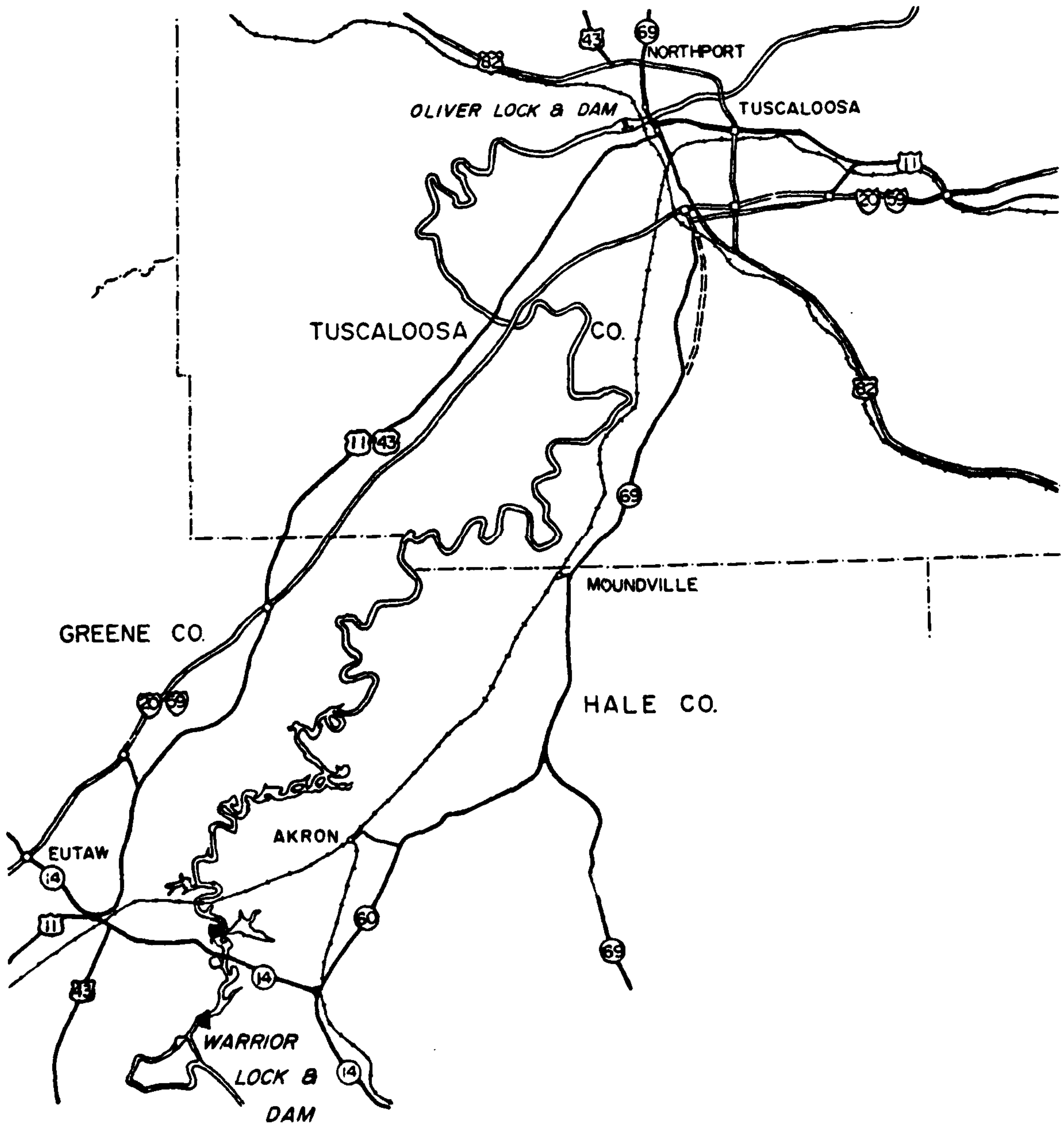


Figure 3-11. Distribution of Water Primrose (*Ludwigia pepoloides*), Middle Black Warrior and Tombigbee Rivers, September 1978 and August 1979

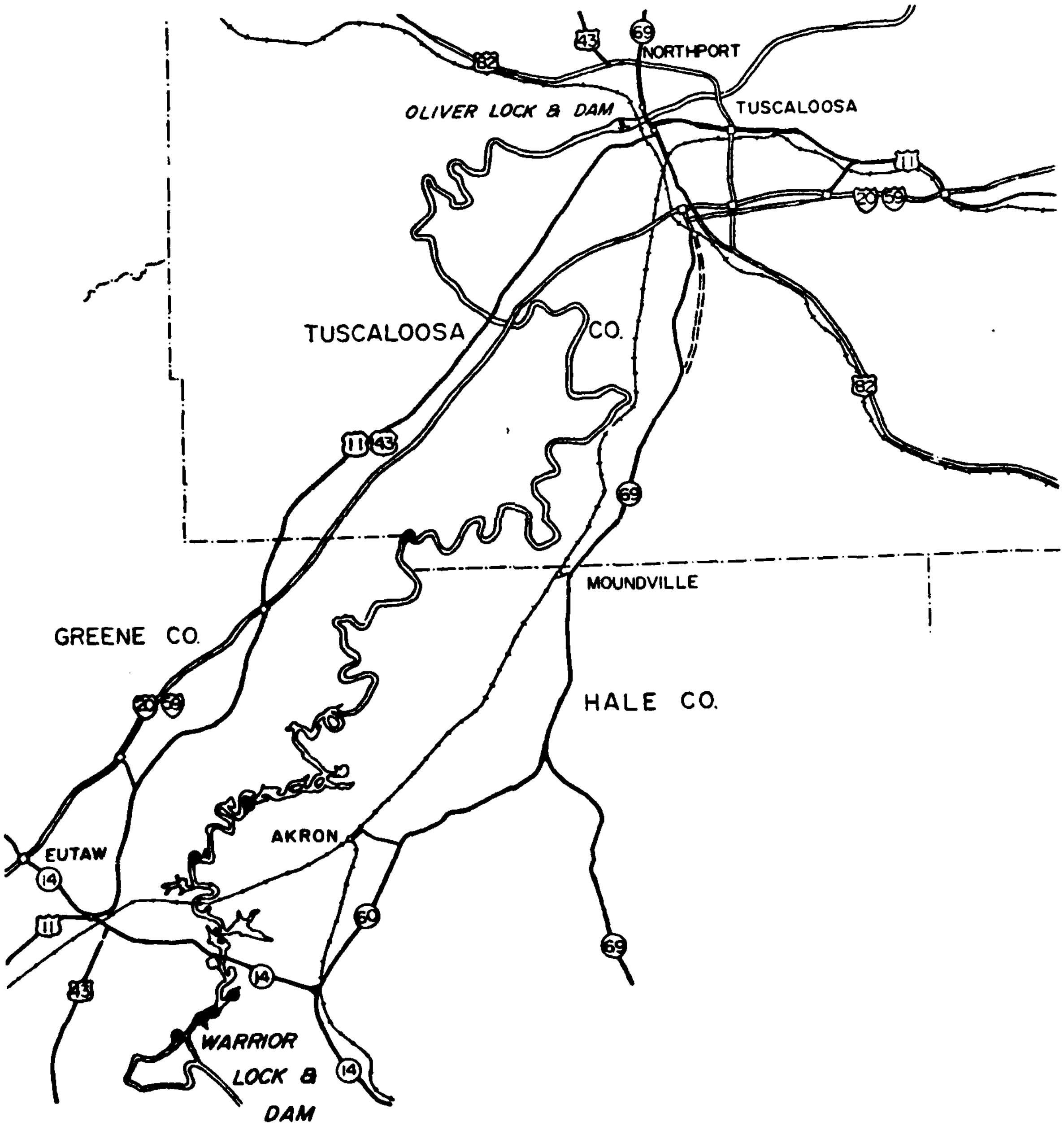
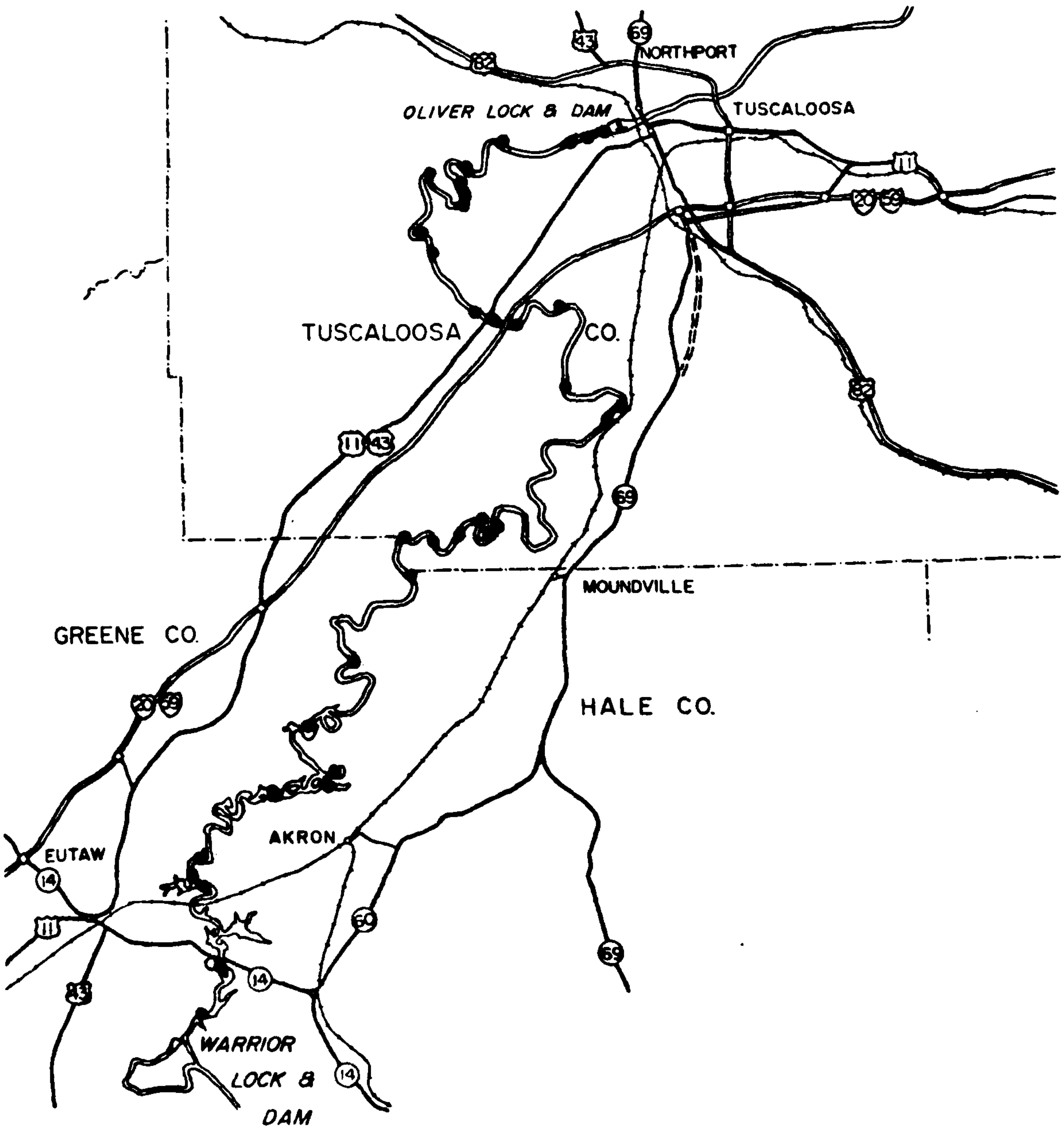


Figure 3-12. Distribution of Panicum, Middle Black Warrior and Tombigbee Rivers, September 1978 and August 1979



SECTION 4

DISCUSSION

4.1 Overview of Water Quality Characteristics of the Middle Black Warrior-Tombigbee River System

The Middle Black Warrior and Tombigbee Rivers display unique patterns of basline water quality. The sources of distinction between the two river basins would appear to be caused by three (3) major controlling factors (in presumed order of importance):

- o geochemical characteristics of the individual watersheds
- o patterns of cultural water resource exploitation
- o amount and extent of impoundment

These factors combine in such a way that a single description of the water quality of the Middle Black Warrior and Tombigbee Rivers is not possible.

To provide some insight into the specific differences in water quality, Table 4-1, which displays the grand average for various constituents in each basin, was prepared. Included in this table is the grand average for the water quality parameters monitored in Demopolis Lake.

Cursory review of this tabulation reveals several major trends in the different basins. The Tombigbee River has a lower clarity than did the Black Warrior River, as indicated by the depth 1% light remains (euphotic zone), turbidity, transparency and color. Alkalinity, hardness, calcium chlorides, non-filterable residue, dissolved and total iron were consistently higher in the Tombigbee River while dissolved minerals (magnesium, sodium, potassium), ammonia, nitrate-nitrite sulfates, manganese and zinc were lower in the Tombigbee River. pH levels were circumneutral, dissolved oxygen was well above the aquatic life criterion of 5.0 mg/l and temperatures averaged $24.0^{o} \pm 0.2^{o}C$ in all basins. These average values indicate that various processes are at work creating different physical-chemical water quality characteristics in the two main rivers. It should be noted that for all but two parameters (temperature and potassium), the parameter values for Demopolis Lake are between or equal to, the values in the main rivers.

In contrast to the distinct differences in physical-chemical constituents, the aquatic biota in the rivers were essentially similar. The major differences arose in the total numbers of organisms in the plankton or the benthos. As can be seen on Figures 3-1 through 3-4, the total numbers (or biomass in the case of benthos) are the lowest in the "free flowing" sections such as the Upper Warrior Lake and the Tombigbee River at R-17 and R-18. It would appear that the water quality differences between the two rivers are not great enough to alter the biota significantly.

TABLE 4-1. Summary of Average Water Quality Conditions, Middle Black Warrior and Tombigbee Rivers, July 1978 thru November 1979

PARAMETER	BLACK WARRIOR RIVER (Stations R-1-R-16)	TOMBIGBEE RIVER (Stations R-17-R-21)	DEMOPOLIS LAKE (Stations R-22 & R-23)
Temperature (°C)	23.8	24.0	24.2
Depth 1% Light Remains (ft.)	7.2	4.7	6.9
Turbidity (FTU)	18	41	24
Transparency (M)	0.8	0.5	0.6
ORP (mV)	398	375	390
Specific Conductance (μm/cm @ 25°C)	175	125	158
Dissolved Oxygen (mg/L)	8.6	7.8	8.0
pH	7.2	7.6	7.3
Color (Pt-Co Units)	15	37	31
Alkalinity, Total (mg/L as $CaCO_3$)	25	41	28
Calcium, Total (mg/L)	9.8	16.5	13.1
Magnesium, Total (mg/L)	5.30	2.12	3.61
Hardness, Total (mg/L as $CaCO_3$)	53	59	56
Chlorides (mg/L)	7	9	8
Pottasium, Total (mg/L)	2.19	2.15	2.34
Sodium, Total (mg/L)	9.27	5.98	6.63
Sulfate, Dissolved (mg/L)	42	8	27
Sulfides, Total (mg/L)	0.3	0.3	0.2
Residue, Total Filterable (mg/L)	118	91	111
Residue, Total Non-filterable (mg/L)	22	61	28
CO_2 (calculated mg/L)	4.4	3.2	3.6
Ammonia-N (mg/L)	0.14	0.11	0.11
Nitrate-Nitrite-N(mg/L)	0.55	0.21	0.42
Total Kjeldahl-N (mg/L)	0.49	0.74	0.63
Total Inorganic-N (mg/L)	0.66	0.27	0.53
Total Organic-N (mg/L)	0.37	0.66	0.47
Total-N (mg/L)	1.03	0.90	0.97
Dissolved Orthophosphate (mg/L)	0.025	0.046	0.037
Total Phosphorus(mg/L)	0.074	0.180	0.110
Iron, Dissolved (mg/L)	87	260	115
Iron, Total (mg/L)	1.13	3.37	1.8
Manganese, Dissolved (μg/L)	94	26	42
Manganese, Total (μg/L)	154	108	108

TABLE 4-1 (Continued)

PARAMETER	BLACK WARRIOR RIVER (Stations R-1-R-16)	TOMBIGBEE RIVER (Stations R-17-R-21)	DEMOPOLIS LAKE (Stations R-22 & R-23)
Zinc, Total (μg/L)	86	76	84
ATP (ng/L)	39	31	33
Chlorophyll *a* (μg/L)	8	10	8
Fecal Coliforms (#/100ml)	200	418	275
Fecal Streptococci (#/100ml)	310	460	285
Dissolved Organic Carbon (mg/L)	4.3	7.4	5.7
Total Organic Carbon (mg/L)	4.8	8.9	7.8

These trends indicate that the major influences producing the baseline water quality differences between the two rivers are the geochemical makeup of the river basin and the amount and nature of cultural input received. The geochemical aspect is especially important on the Black Warrior River, where drainage and run-off from the surface mining activity and the specific area geology is responsible for increased levels of such constituents as sulfates, iron, manganese, zinc and total dissolved solids. The Tombigbee River, which shows higher levels of suspended solids, phosphates, organic nitrogens and organic carbons, is assumed to be receiving greater amounts of agricultural run-offs. These two major influences, each dominant in a separate river basin, appear to be the primary sources of water quality variation between the two basins.

The effects of impoundment were less quantifiable than the other two causes of water quality variation. Neither the Tombigbee River nor the Black Warrior River, with its more extensive impoundment, showed any severe effects such as complete deoxygenation of deep waters which are often associated with impoundment. Biological productivity, especially as measured by numbers of phyto- and zooplankton, was somewhat affected by the impoundments. The slowing and widening of the river, with a concomitant increase in the volume of the euphotic zone, produced an obvious increase in plankton numbers in both Warrior Lake and Demopolis Lake (see Figures 3-1 and 3-2). Benthos differences were primarily noted as increased biomass in the lacustrine sections (Figure 3-3). Interestingly, Shannon-Weaver diversity values did not vary much in the lake sections, although examination of the species composition (e.g. Appendix N-3) will show some degree of change between the riverine and lacustrine secitons. Impoundment apparently had more effect as a "ponding" situation (as regards the biota) than it did in producing physical-chemical stratification. The Middle Black Warrior and Tombigbee Rivers have distinctly differing water quality characteristics. These characteristics are produced by differing geological features in the river basins as well as the extent and nature of water resource exploitation. The impoundment of the Black Warrior River at Warrior Lake and Demopolis Lake appears to have no effect on overall water quality, but does increase biological productivity. The average water quality in each basin in unique, but the seasonal variations produce wide ranges of concentrations in most of the studied parameters.

4.2 Variation of Water Quality in the Middle Black Warrior and Tombigbee Rivers

The major trend observed for the Middle Black Warrior and Tombigbee Rivers system was the extreme seasonal variation in levels of most monitored parameters. For the majority of the physical-chemical parameters experiencing these seasonal fluctuations, the general pattern was summer minima with late winter or early spring maxima. Additionally, when certain parameters are evaluated on a "concentration versus downstream distance" plot across several seasons, variations in the relative concentrations between stations are revealed. These water quality characteristics appear to be most affected by seasonal patterns of rainfall and subsequent patterns of flow and flooding. The second maxima and minima of various indicator water quality constiuents and biological communities follow the patterns of rainfall increase and decrease.

Figure 4-1 illustrates the total daily precipitation at four stations within the study area. As can be seen, precipitation was more prevalent during the late winter (December 1978 thru February 1979) and on into the spring (thru late April 1979). The heaviest rains occurred in mid-April 1979 with a one day maximum of 10.2 inches (a study area wide average for that same period was 6.8 inches, with the lowest rainfall being recorded at the most downstream station). This rainfall coincided with several floodings throughout the Middle Black Warrior-Tombigbee River basins. This pattern of precipitation closely coincides with variations of several major parameters.

Because of the magnitude of the present study, not all investigated parameters will be considered in relation to seasonal patterns. However, several parameters have been condisered in this manner, and these parameters generally represent several related parameters. In the same way, four stations, one in each river section, have been chosen to represent typical concentrations of these parameters during each sampling. In the downstream analyses, three dates have been chosen to represent 'critical' periods during the study, i.e. summer 1978, spring 1979 (after the heaviest rainfalls) and late summer 1979 (low flow). These combinations will allow for explication of the seasonal patterns of physical chemical parameter increase and decrease.

The direct effects of precipitation on water quality come from drainage basin run-off. A principal effect of this run-off is an increase in the suspended sediments loading to the main river. Figure 4-2 illustrates the response of non-filterable residue (total suspended solids) to increased levels of precipitation. Warrior Lake, represented by station R-2, showed little variation in suspended solids loading at any time during the study. All other representative stations exhibited drastically increased suspended solids loadings during sampling trips 5 and 6, which coincides with the increased mid-to-late winter increases in precipitation. The depth of the euphotic zone (Figure 4-3) shows this same general pattern, displaying marked decrease of light penetration during these same samplings. These two parameters are representative of all measures of clarity (see Section 3.1.1). Of note, specific conductance, (Figure 4-4) which is a measure of total ionized substances, was lower during the periods of rainfall (and the colder months in general), perhaps indicating direct dilution by the purer rainwaters with less geological contact time in which to dissolve mineral constituents.

Other parameters which play a significant role in overall water quality are nutrients and metals. Nutrient additions affect the biological communities by stimulation of algal growth. Algal metabolites can produce taste, coloration and even health problems which might limit water use. Orthophosphates and inorganic nitrogen (TIN) are the major nutrients needed for plant growth (U.S.E.P.A. 1978). These two parameters show less direct influence by total rainfall than other parameters. However, orthophosphates (Figure 4-5) do show a general trend of increase throughout the spring and summer. The high orthophosphate concentration recorded in August 1979 may have been related to agricultural applications of fertilizer being contributed by run-off during this period. TIN (Figure 4-6), while it did increase at two stations after the intense rainfall, reached its highest levels in June 1979, possibly indicating fertilization practices. The two heavy metals most intensly studied, iron and manganese (Figures 4-7

Figure 4-1. Precipitation at Selected Gauge Stations in the Middle Black Warrior And Tombigbee Drainage Basins, July 1978 through October 1979.

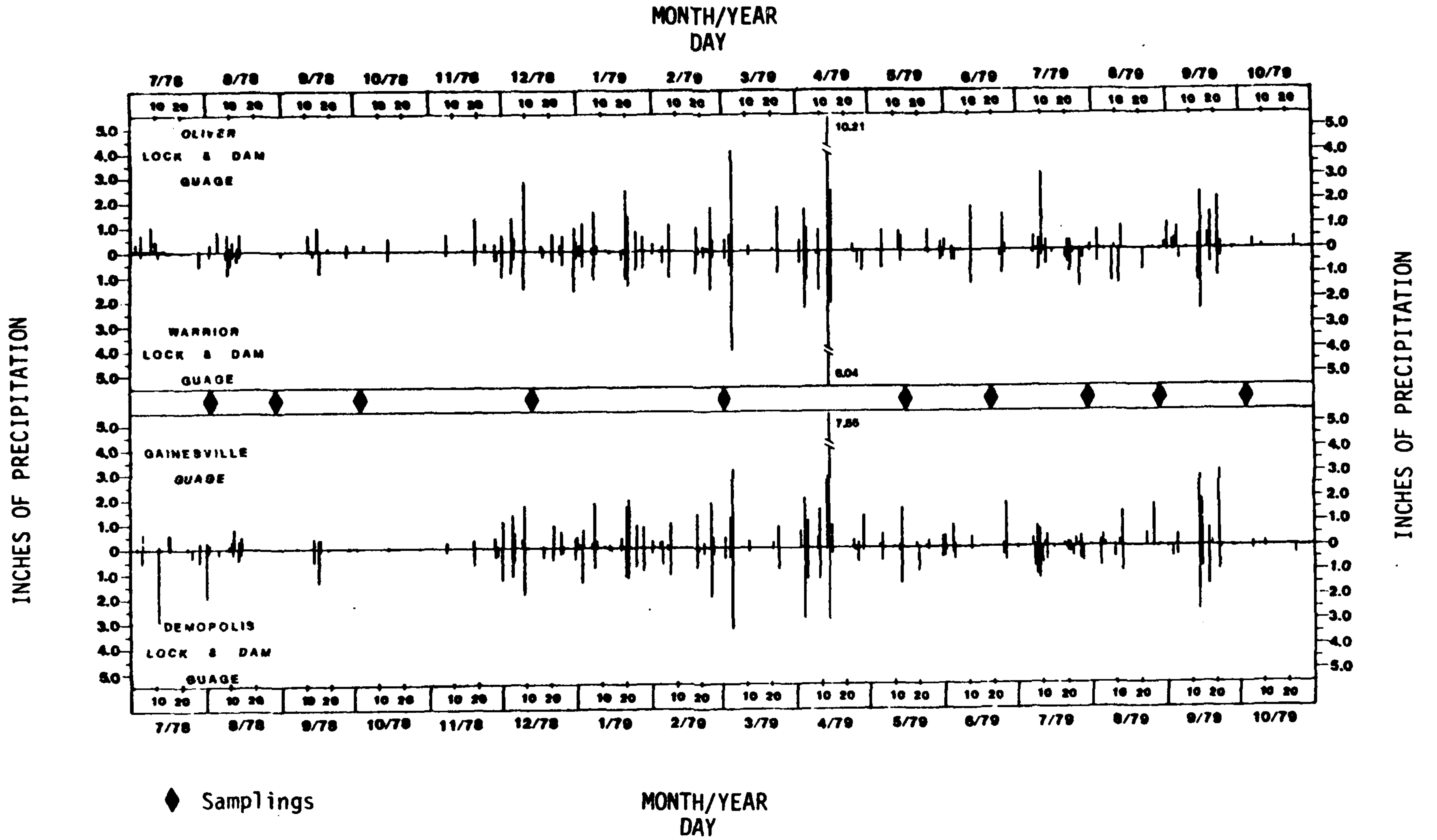


FIGURE 4-2. TOTAL NON-FILTERABLE RESIDUE AT SELECTED RIVER STATIONS, MIDDLE BLACK WARRIOR-TOMBIGBEE RIVERS, JULY 1978 THRU OCTOBER 1979

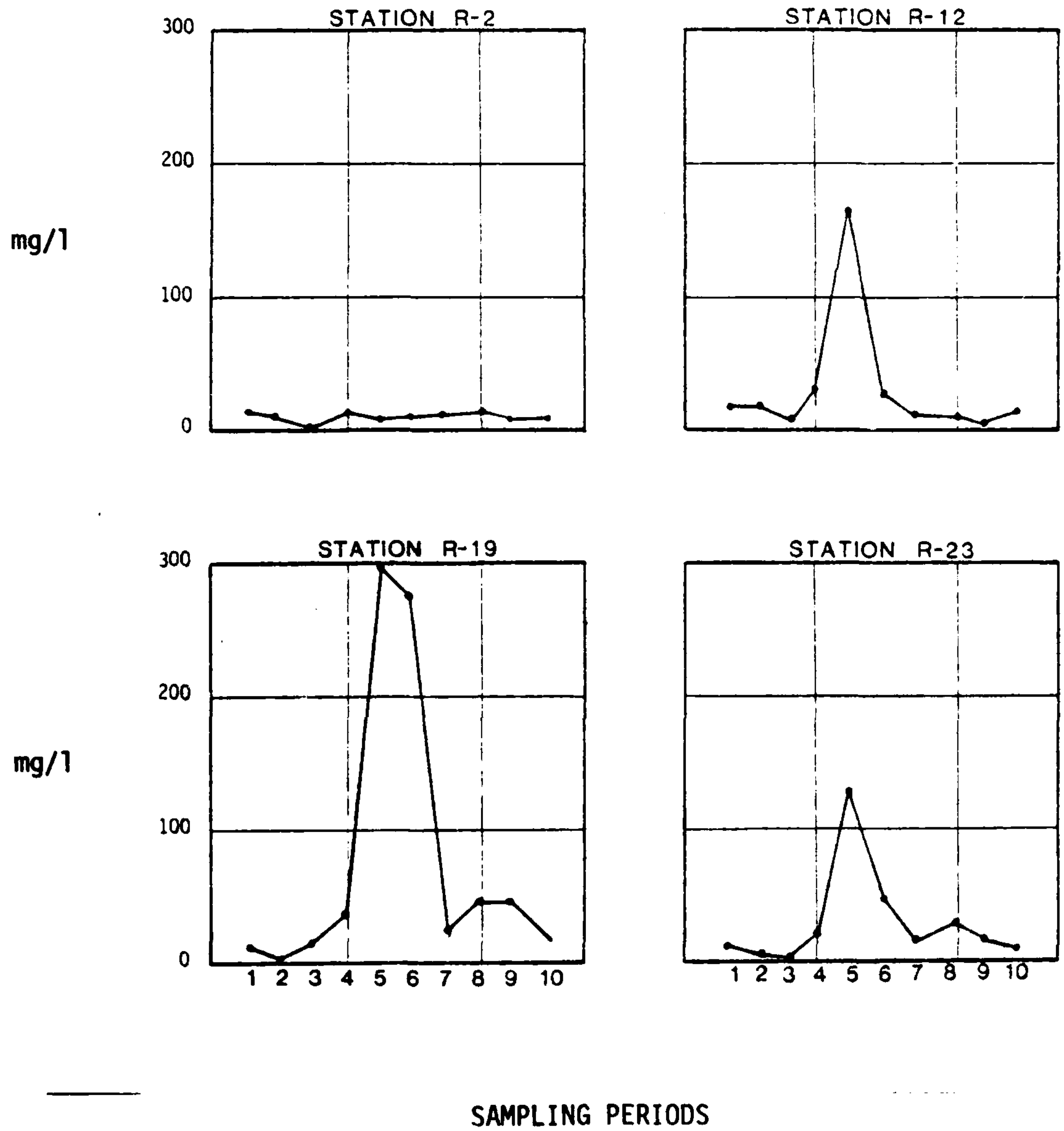


FIGURE 4-3. DEPTH OF EUPHOTIC ZONE AT SELECTED RIVER STATIONS, MIDDLE BLACK WARRIOR-TOMBIGBEE RIVERS, JULY 1978 THRU OCTOBER 1979

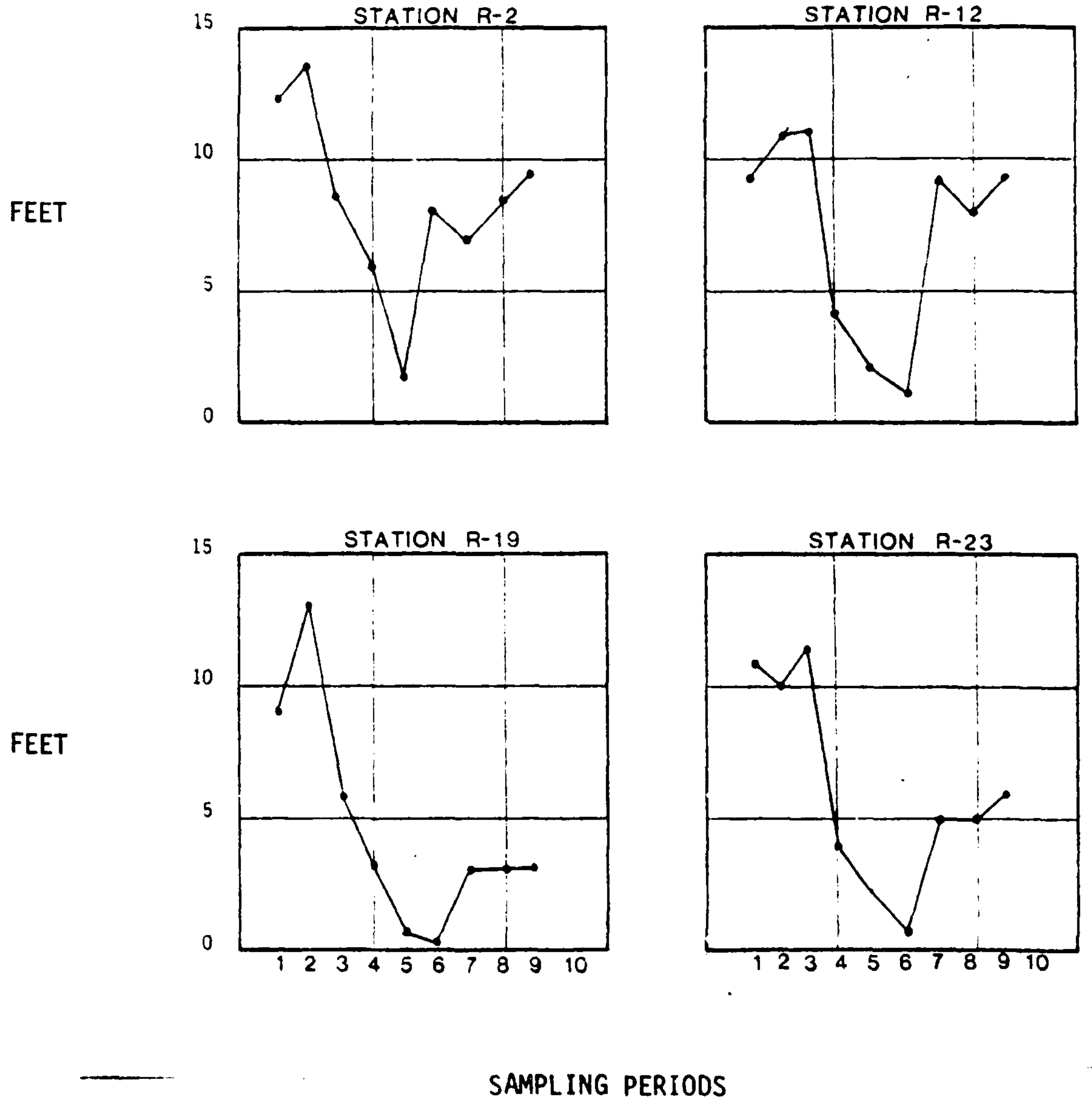


FIGURE 4-4. SPECIFIC CONDUCTANCE AT SELECTED RIVER STATIONS, MIDDLE BLACK WARRIOR-TOMBIGBEE RIVERS, JULY 1978 THRU OCTOBER 1979

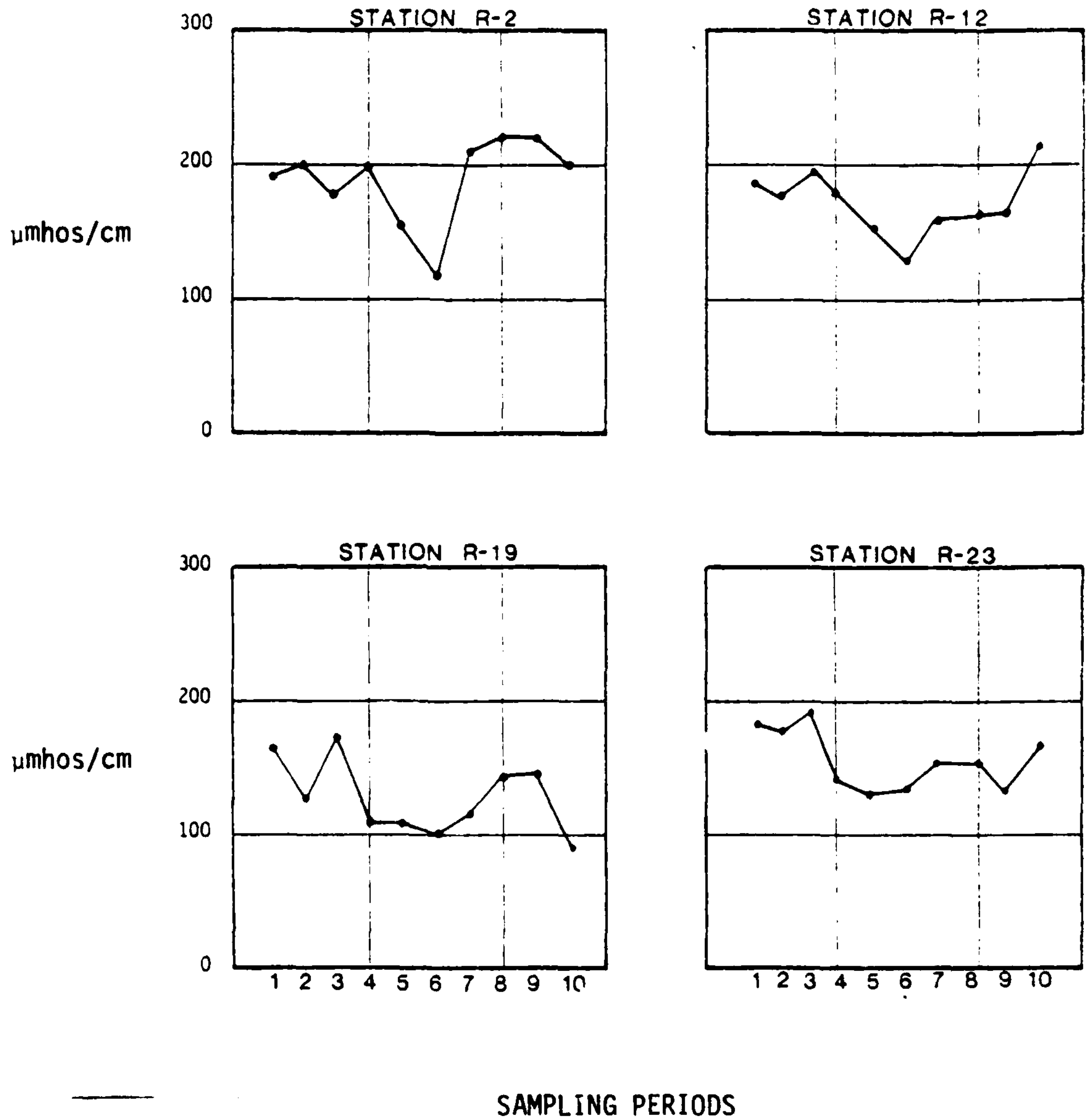


FIGURE 4-5. TOTAL ORTHOPHOSPHATE AT SELECTED RIVER STATIONS, MIDDLE BLACK WARRIOR-TOMBIGBEE RIVERS, JULY 1978 THRU OCTOBER 1979

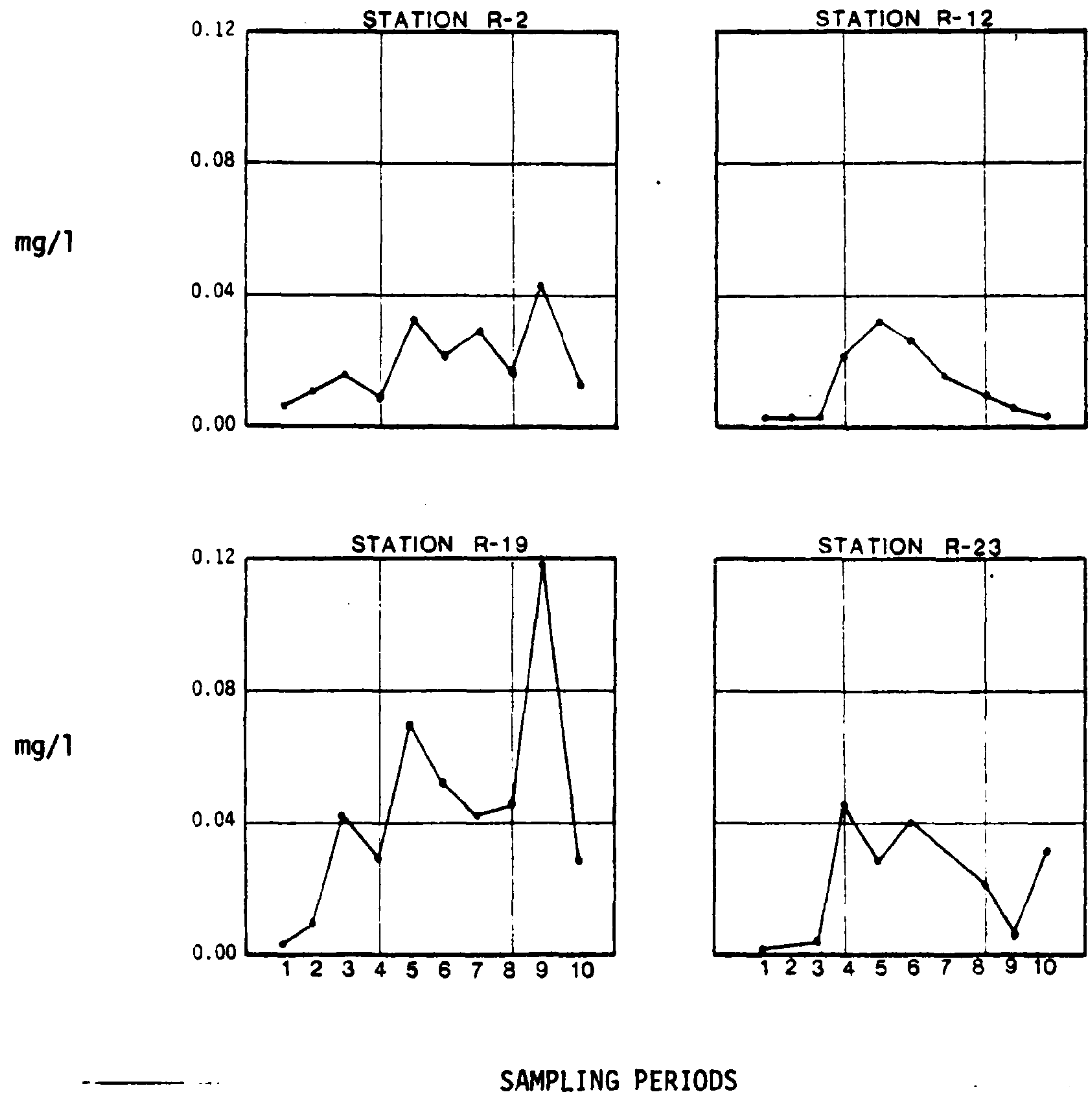


FIGURE 4-6. TOTAL INORGANIC NITROGEN AT SELECTED RIVER STATIONS, MIDDLE BLACK WARRIOR AND TOMBIGBEE RIVERS, JULY 1978 THRU OCTOBER 1979

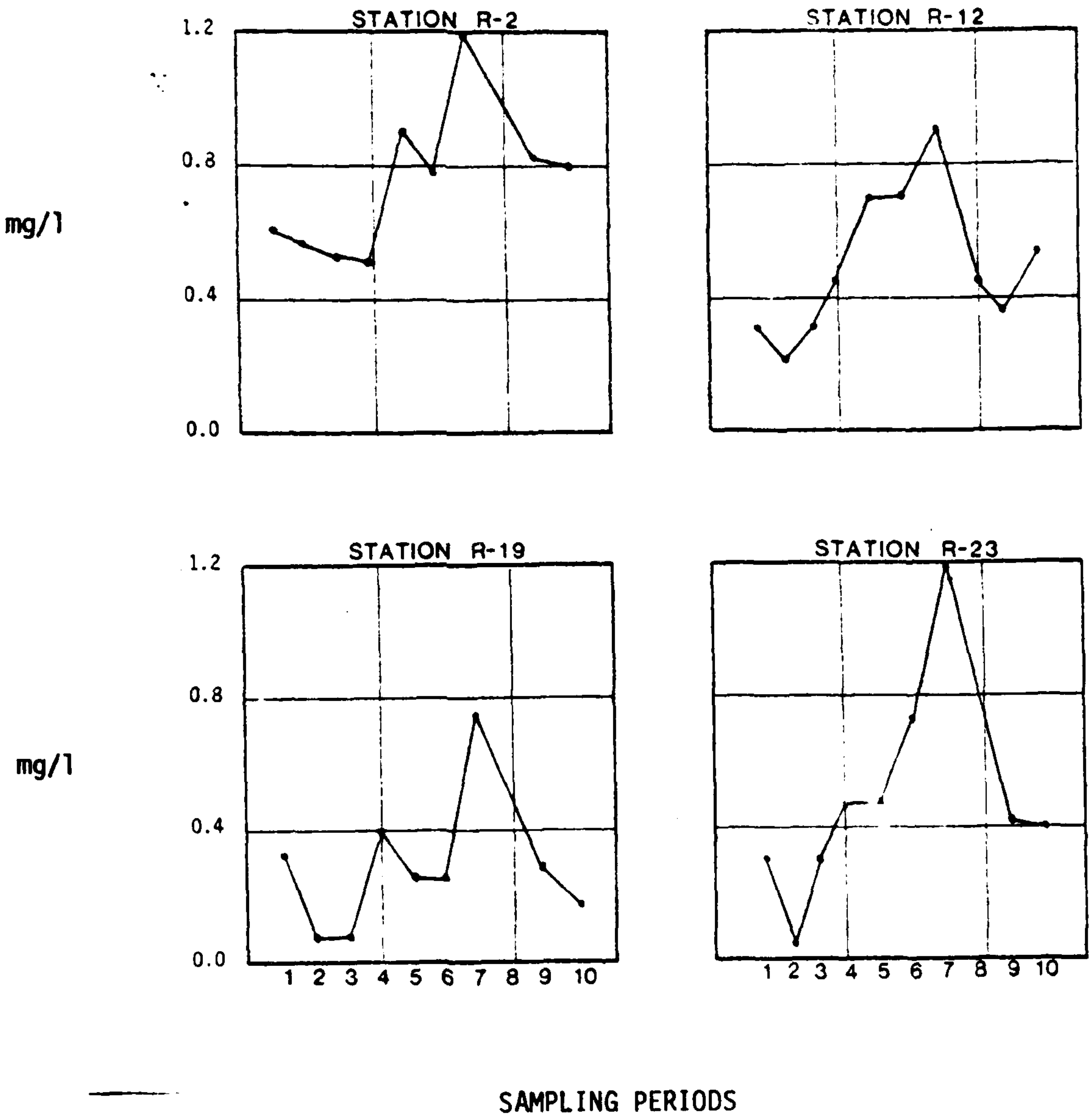


FIGURE 4-7. TOTAL IRON AT SELECTED STATIONS, MIDDLE BLACK WARRIOR AND TOMBIGBEE RIVERS, JULY 1978 THRU OCTOBER 1979

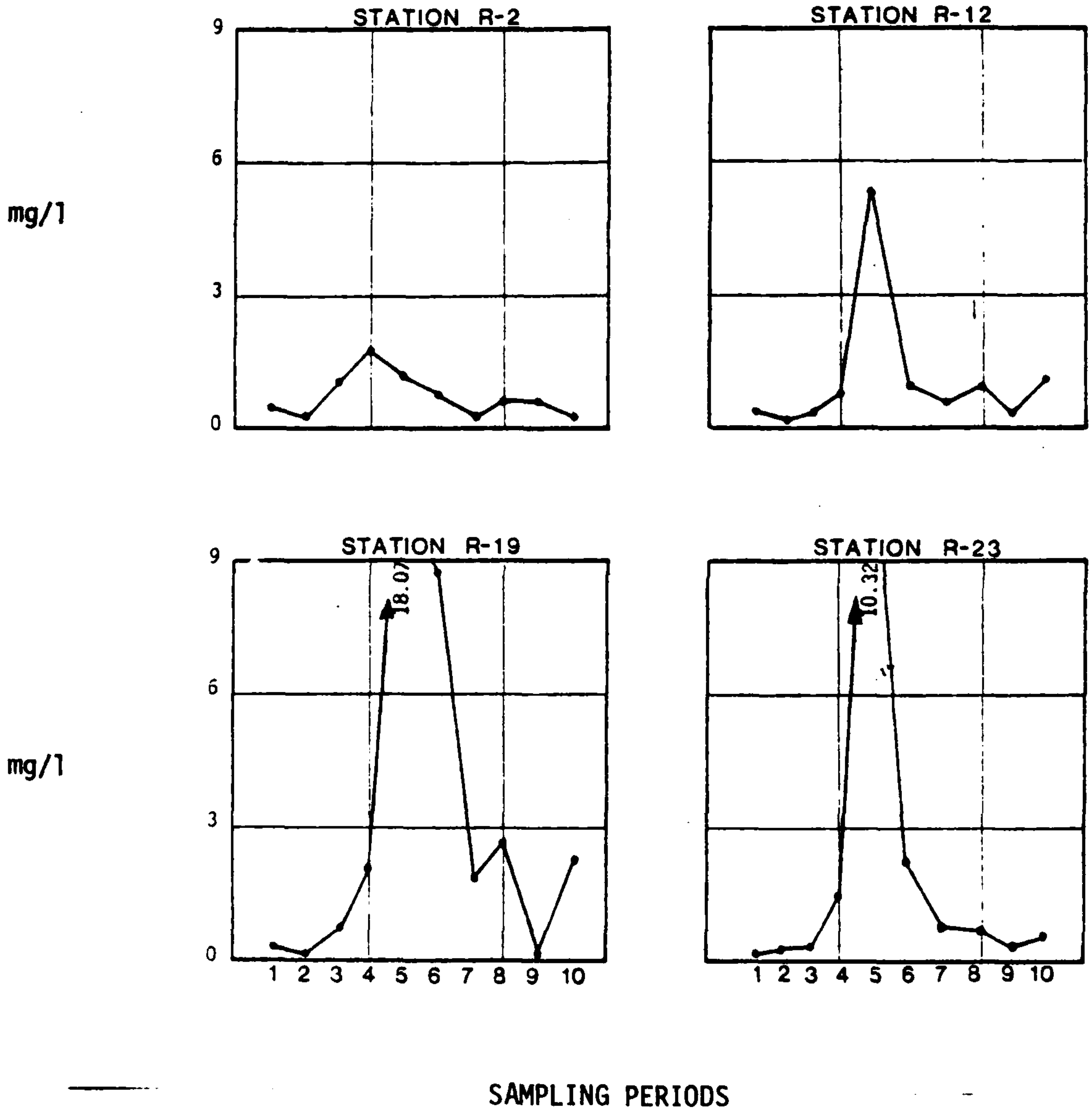
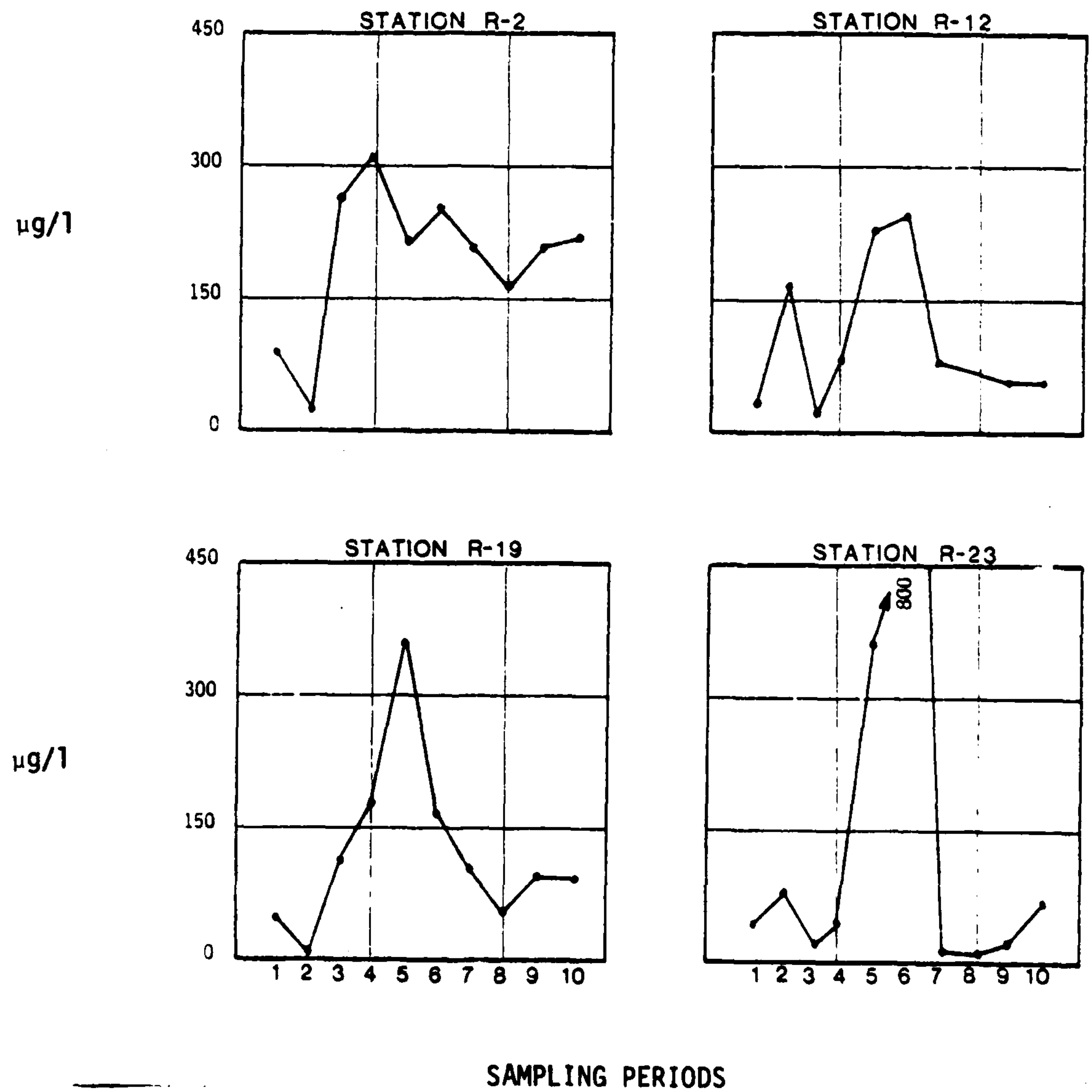


FIGURE 4-8. TOTAL MANGANESE AT SELECTED STATIONS, MIDDLE BLACK WARRIOR-TOMBIGBEE RIVERS, JULY 1979 THRU OCTOBER 1980



and 4-8, respectively), both reached their maximum concentrations during the flood season.

While these metals became more prevalent during the flood season, it should be noted that, because both of these elements are common in sediments (see Appendix J), extremely elevated values may represent a direct correlation with increased suspended sediments and not actual high ionic concentrations of all heavy metals. These example parameters indicate that seasonal patterns of constituent concentrations in the Middle Black Warrior-Tombigbee Rivers are controlled by climatological factors such as rainfall and perhaps cultural practices such as the application of fertilizers in the spring.

An analysis of concentration versus distance reveals more distinct downstream trends and relationships between the river basins during several seasons. Figure 4-9 illustrates the concentrations of dissolved oxygen (DO) at the five foot depth in the entire study area during three samplings. This figure clearly demonstrates the overall high DO for all river sections and indicates a good assimilative capacity (e.g. the low DO levels at T-4 during all months, are quickly mitigated by the time the water passes R-6). Specific conductance (Figure 4-10) also displayed a relatively constant level and good assimilative capacity (see D-3, October 1979).

Other parameters appear to be more influenced by drainage basin characteristics or impoundment. Two examples of this pattern are nonfilterable residue (suspended solids) and inorganic nitrogen (TIN). Suspended solids (Figure 4-11) were quite high during the flood period (see above). Another interesting feature, however, is the marked decrease in suspended solids loadings downstream of Warrior Lock and Dam (below R-9). The decreased water velocity within the impoundment is apparently allowing for sufficient settling to decrease suspended solids downstream. TIN (Figure 4-12) displays very constant downstream concentrations in the Black Warrior River with distinctly lower values in the Tombigbee River.

Orthophosphates, the other essential plant nutrient, has a more distinct seasonal pattern of increase (Figure 4-13). The May 1979 sampling proved to have much higher levels of this nutrient. The Tombigbee River had elevated values during all 1979 samplings (Appendix A) with May 1979, shown here, being the greatest. The metal parameters routinely analyzed, total iron (Figure 4-14) and total manganese (Figure 4-15) display very different trends. Total iron is constantly higher in the Tombigbee River after the intense rainfalls, while the Black Warrior River maintained relatively stable levels at each station. Total manganese showed a one time increase in the spring 1979 and returned to its 1978 levels. Like iron however, manganese was much higher in the Tombigbee River than in the Black Warrior River.

The analysis of selected water quality parameters reveals patterns of seasonal and river basin associated variation. The occurrence of severe flooding during the middle of this study produced conditons of elevated loadings of many parameters. Other inputs, such as agricultural run-off appear to influence water quality as well. This combination of natural and cultural influences produced distinct and unique water quality characteristics in the Middle Black Warrior and Tombigbee Rivers.

FIGURE 4-9. DISSOLVED OXYGEN DURING SELECTED SAMPLINGS,
MIDDLE BLACK WARRIOR-TOMBIGBEE RIVERS, July 1978 thru October 1979

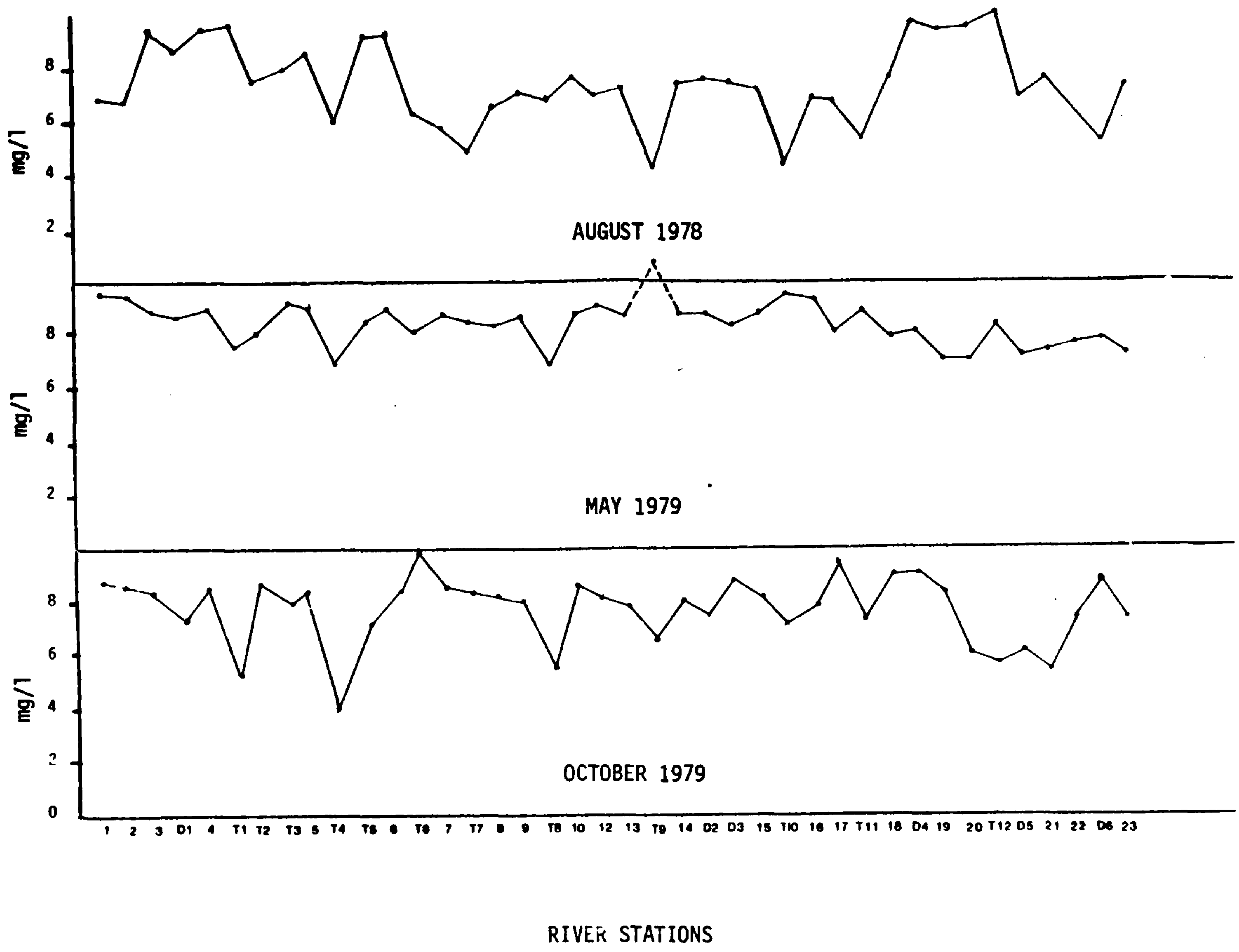


FIGURE 4-10. SPECIFIC CONDUCTANCE DURING SELECTED SAMPLINGS, MIDDLE BLACK WARRIOR AND TOMBIGBEE RIVERS, July 1978 thru October 1979

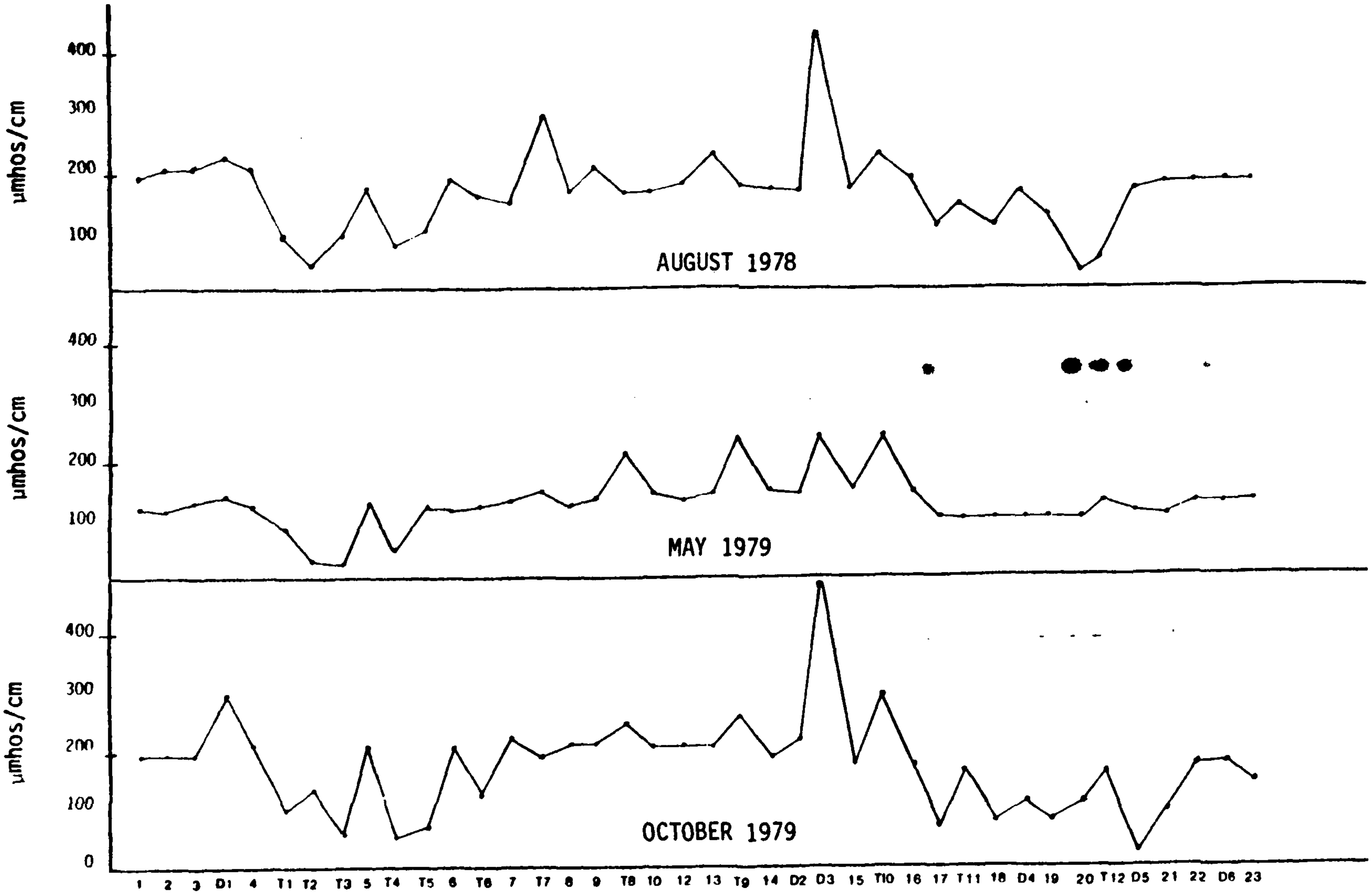


FIGURE 4-11. TOTAL NON-FILTERABLE RESIDUE DURING SELECTED SAMPLINGS, MIDDLE BLACK WARRIOR AND TOMBIGBEE RIVERS, July 1978 thru October 1979

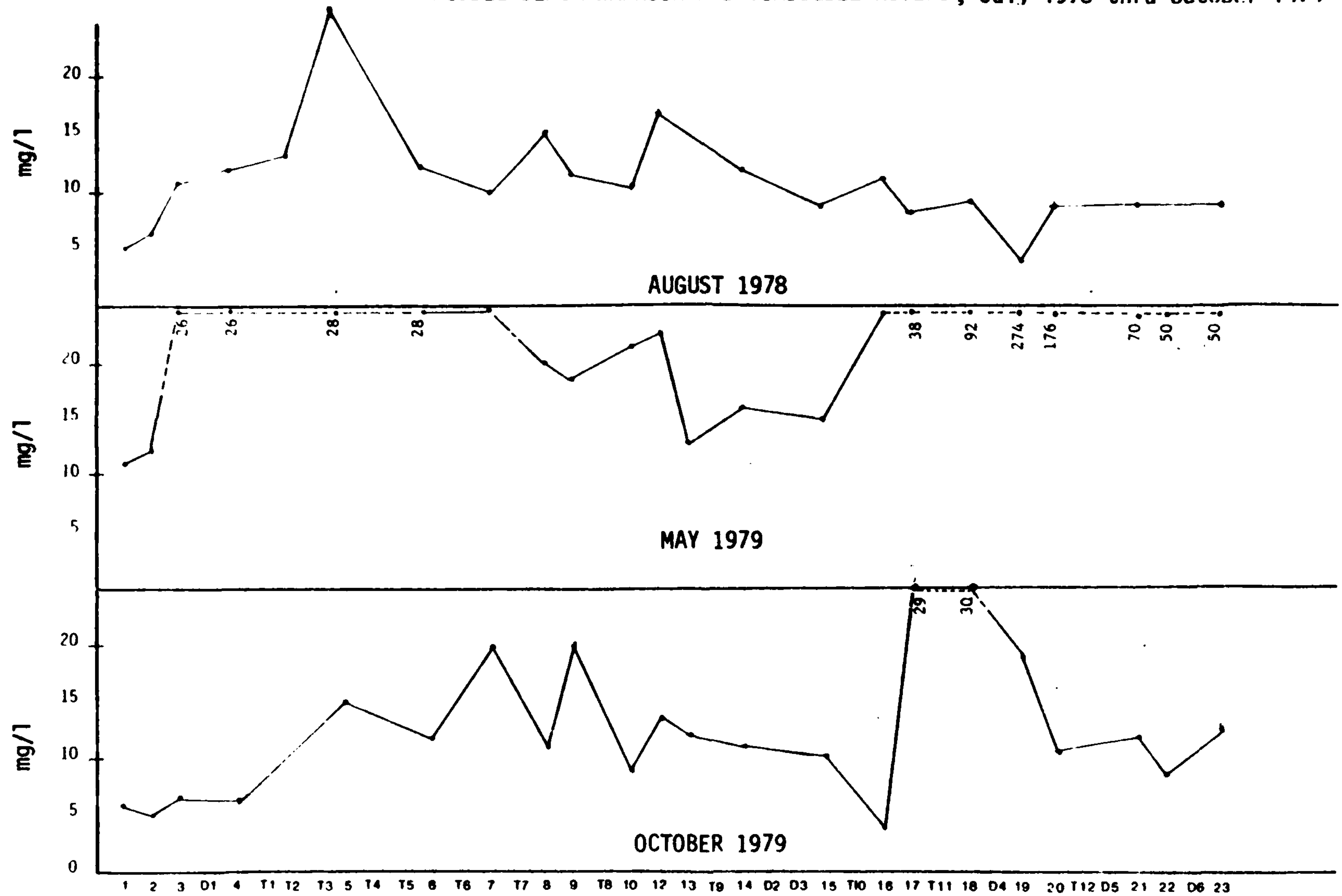


FIGURE 4-12. TOTAL INORGANIC NITROGEN DURING SELECTED SAMPLINGS, MIDDLE BLACK WARRIOR - TOMBIGBEE RIVERS, July 1978 thru October 1979

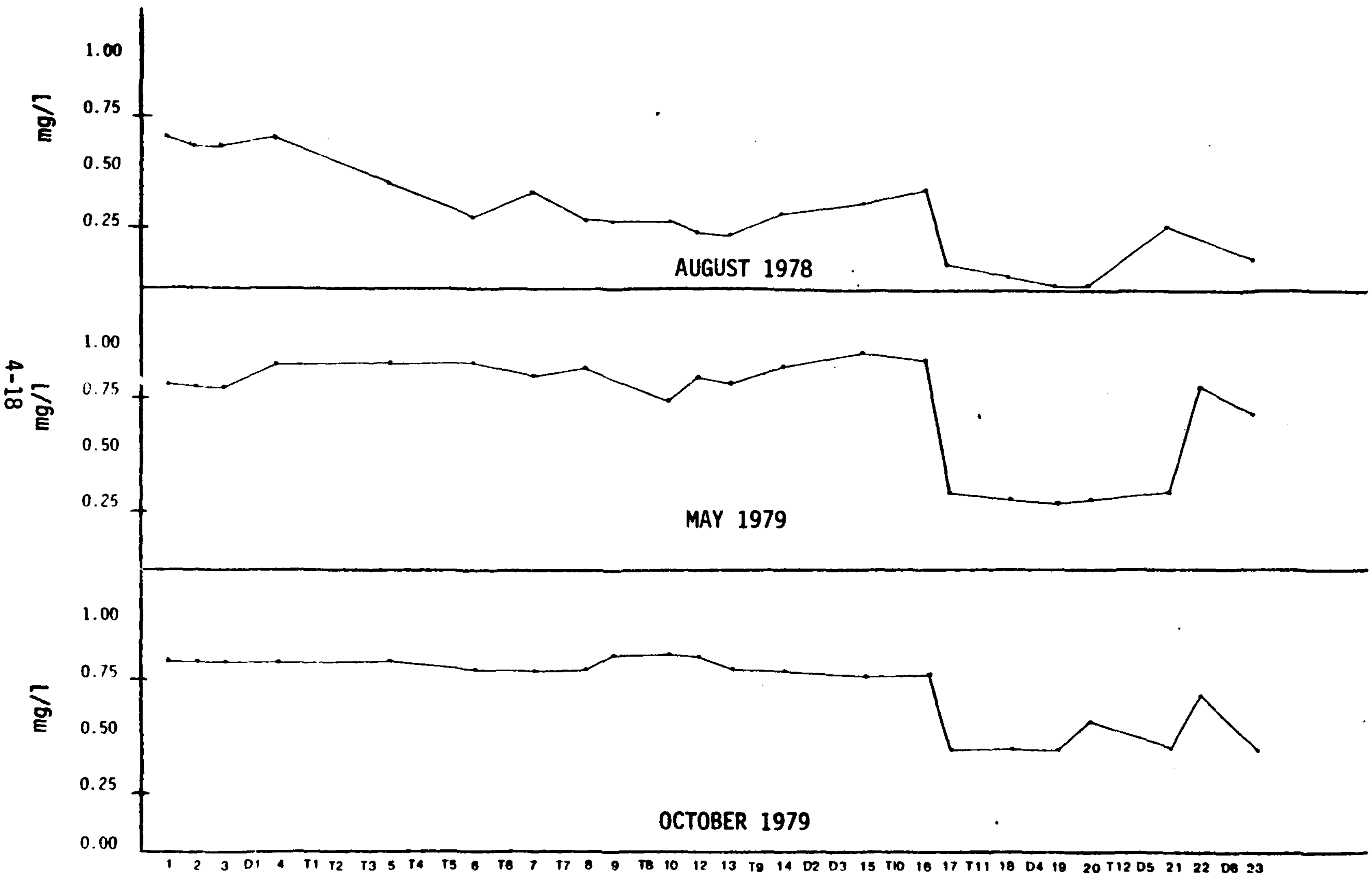


FIGURE 4-13. ORTHOPHOSPHATES DURING SELECTED SAMPLINGS, MIDDLE BLACK WARRIOR AND TOMBIGBEE RIVERS, July 1978 thru October 1979

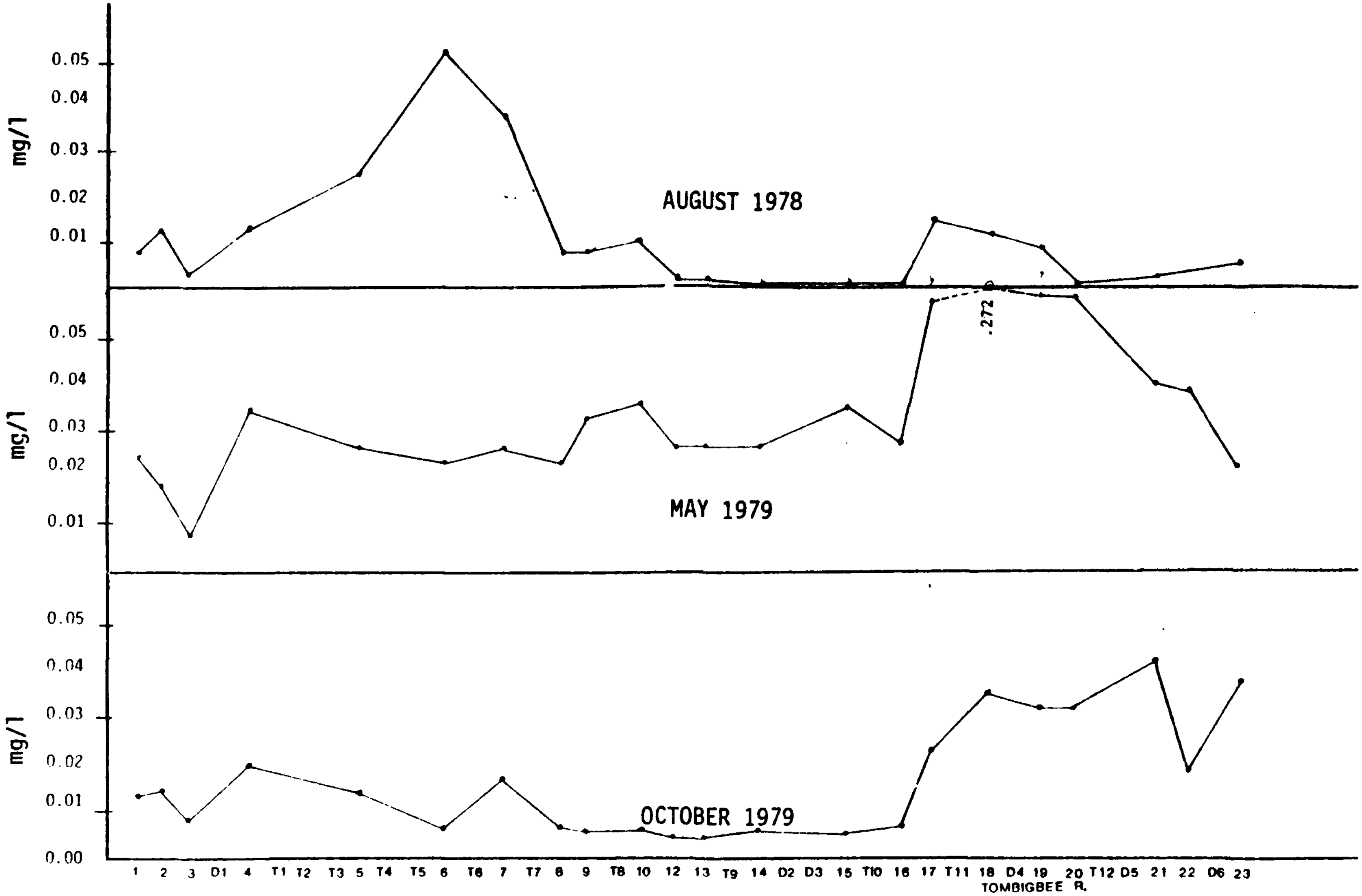


FIGURE 4-14. TOTAL IRON DURING SELECTED SAMPLINGS, MIDDLE BLACK WARRIOR-TOMBIGBEE RIVERS
July 1978 thru October 1979

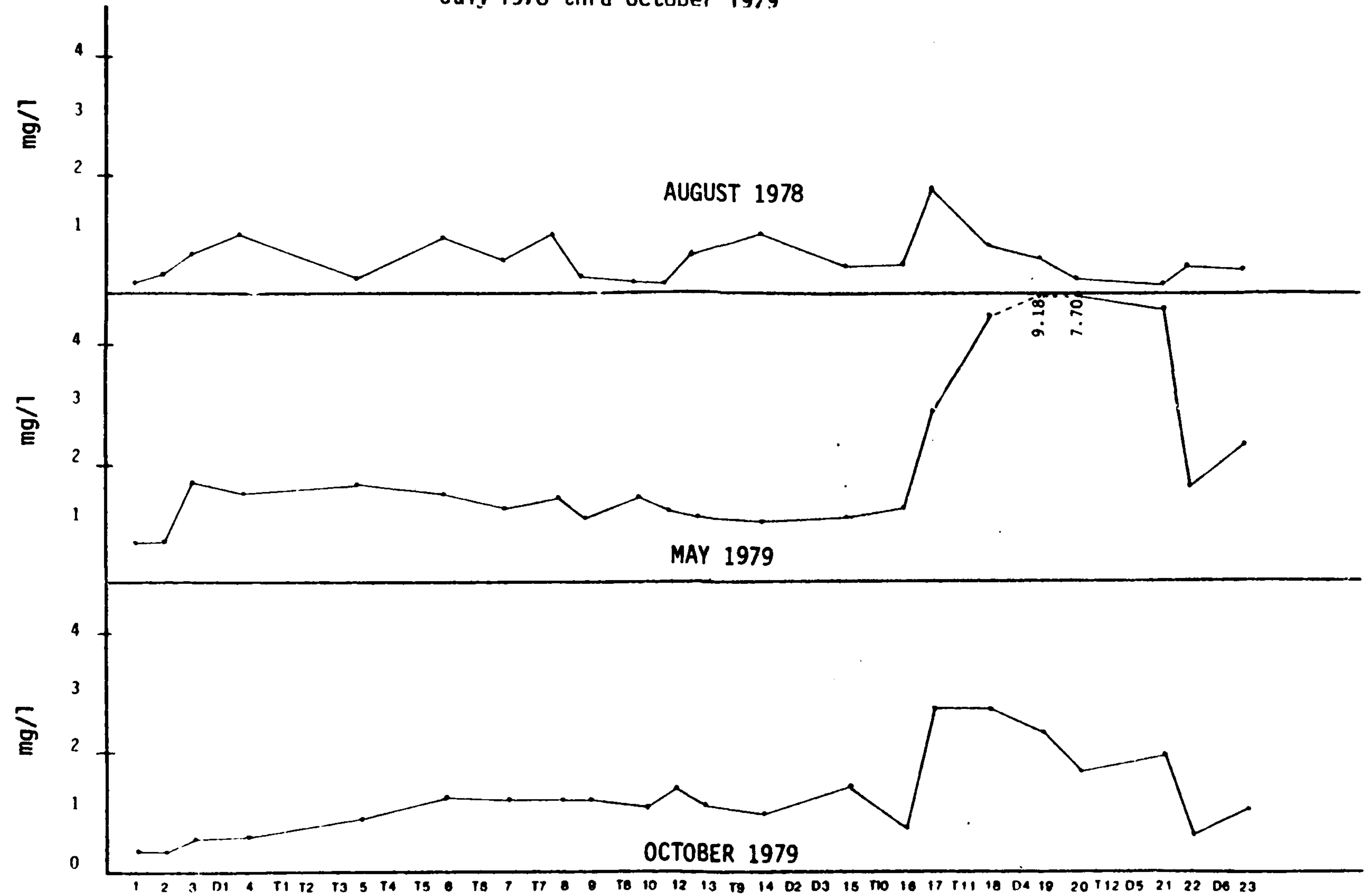
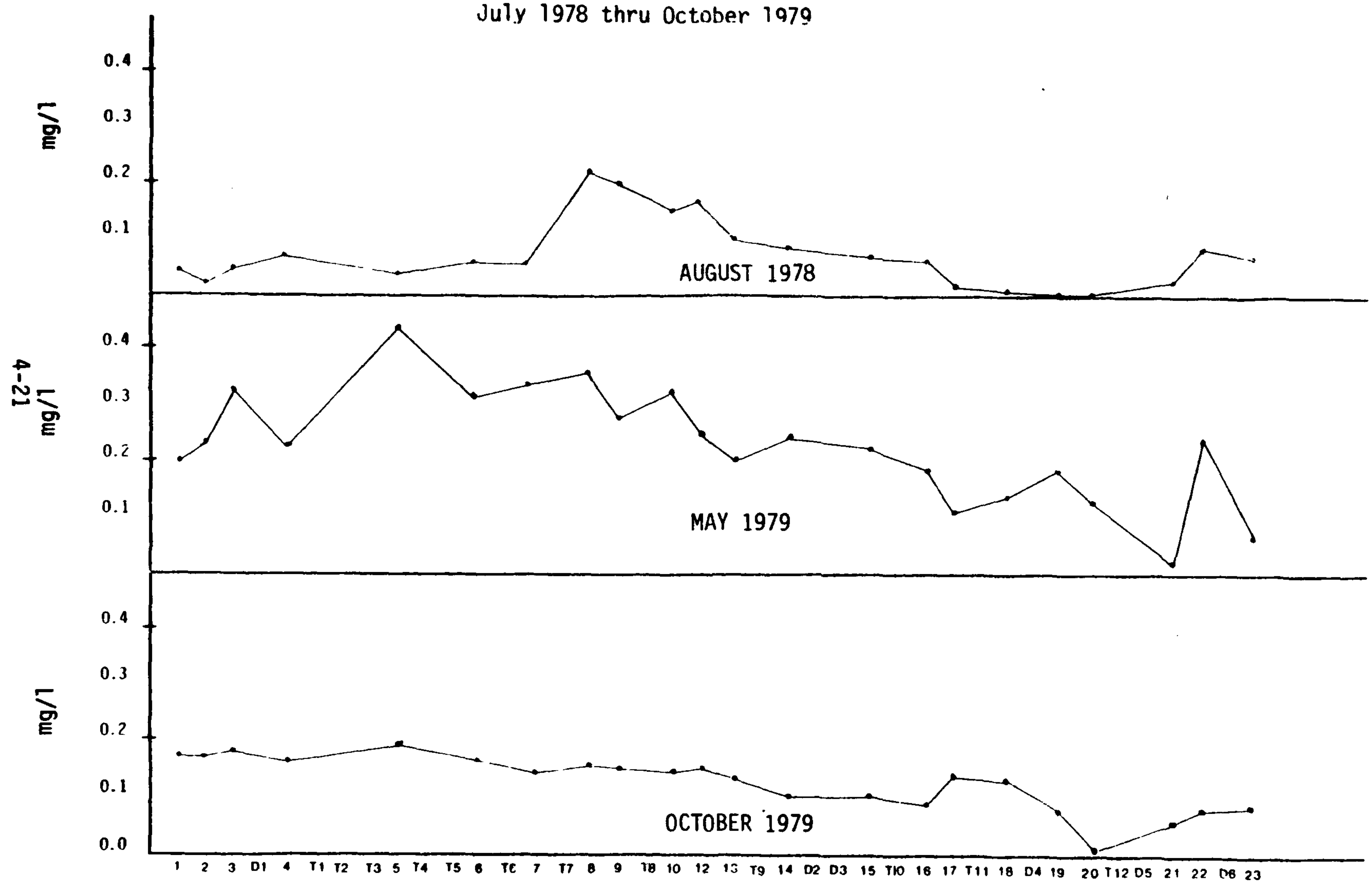


FIGURE 4-15. TOTAL MANGANESE DURING SELECTED SAMPLINGS, MIDDLE BLACK WARRIOR-TOMBIGBEE RIVERS
July 1978 thru October 1979



SECTION 5

RECOMMENDATIONS

1. Continuation of Study. Due to the apparent extreme effects the May 1978 flooding produced, it is recommended that monitoring continue to assess the degree of impact produced by fluctuating flow conditions.

2. Decrease Sampling Points. The homogeniety of the Black Warrior River indicates that fewer stations are needed.

3. Tributary Stations. It is recommended that in future studies, the investigation of tributaries be discontinued and at those suspected of impacting the river proper be investigated as "above-below" situations to assess the in-stream quality in the immediate area.

4. Stratification. This study revealed no major points of stratification in the Middle Black Warrior and Tombigbee Rivers, thus stratification studies could be ceased during future investigations.

5. Sediments. Sediments in and around Tuscaloosa should be studied further (e.g. toxicity evaluations) if dredging is needed below Oliver Lock and Dam.

6. Macroinvertebrates. The scale and usage of multiple plate samplers dictate for this study was not effective and it is recommended this non-comparative device be eliminated from further use in future studies.

SECTION 6

PERSONNEL

Personnel Participating in Water Quality Management Study, Middle Black Warrior and Tombigbee Rivers, July 1978 thru October 1979

HARMON ENGINEERING & TESTING
Auburn Industrial Park, Auburn, Ala. 36830

PARTICIPANT	ASSIGNMENT(S)	TRIPS INVOLVED									
		1	2	3	4	5	6	7	8	9	10
Dallas Alston	Macroinvertebrates	X	X	X	X	X	X	X	X	X	X
Eric Batchelder	Laboratory Technician			X	X						
Steve Beck	Chemist	X	X	X	X	X	X	X	X	X	X
Mary Campbell	QC, Reports	X	X	X	X						
Lan Chu	Pesticides		X								
David Criss	Phyto and Zooplankton						X	X	X	X	X
Ben Currin	Chemist		X	X	X						
Bruce Ferguson	Project Manager	X	X	X	X	X	X	X	X	X	X
Steven Jones	Biological Technician	X	X	X	X	X	X	X	X	X	X
Rick Lester	Chemist						X	X	X	X	X
Loretta McLean	Chemist			X	X	X					
Jim Minchey	Chemist	X	X	X	X						
Ray K. Moore	Sediment Grain Sizing		X						X		
Michael Mullin	Chemist		X	X							
Jan Shearon	Lab Technician, STORET	X	X	X	X	X					
Mark Shearon	Phyto and Zooplankton, QC	X	X	X	X	X					
John Short	Macrophytes, Microbiology	X	X	X	X	X	X	X	X	X	X
Jack Turner	Field Manager, AGP	X	X	X	X	X	X	X	X	X	X
Louise Varnadoe	Chemist	X	X	X	X						
Peggy Wade	Lab Technician, Reports							X	X	X	X

SECTION 7

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APPENDIX A

MAIN RIVER STATION PHYSICAL-CHEMICAL DATA

TABLE A-1 . Physical-Chemical measurements, Main River Stations, Middle Black Warrior-Tombigbee Rivers, July 30 - August 4, 1978.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	7-30	7-30	7-30	7-30	7-31	7-31	8-1	8-1	8-1	8-1	8-2	8-2	8-2	8-2	8-2	8-3	8-3	8-4	8-4	8-4	8-3	8-3
		TIME	1000	1130	1340	1525	1010	1600	1800	1330	1520	1810	0935	1125	1245	1435	1650	1555	1650	0935	1230	1410		0845
		UNITS																						
NONE	Depth	feet	15	23	26	27	25	40	40	50	30	24	37	37	55	50	55	20	15	27	38	55	40	47
00400	pH	S.U.	6.6	7.0	7.1	7.1	6.1	7.9	7.7	7.5	7.6	7.6	6.4	7.5	7.8	8.0	8.1	7.5	8.3	8.5	8.9	8.6	7.9	7.5
00010	Temperature	°C	29.0	29.5	30.0	29.5	29.5	30.5	29.0	29.0	28.5	28.0	29.5	30.5	32.0	31.0	31.0	31.0	30.0	29.5	30.5	30.0	30.5	29.5
00299	DO	mg/ℓ	6.6	7.1	7.7	7.8	8.2	9.0	8.6	8.5	8.5	8.7	8.0	7.6	8.0	8.2	7.4	7.8	7.9	8.8	10.0	8.6	7.2	8.1
00090	ORP	mV	375	350	360	340	470	350	340	340	360	350	410	355	335	335	320	350	330	325	270	310	350	370
00094	Sp. Cond.	µmhos/cm	190	190	185	190	190	180	180	190	185	180	180	190	190	195	200	75	115	160	[illegible]	160	185	185
00077	Trans., S. D.	inches	42	42	24	24	21	25	30	46	38	36	33	32	25	30	30	36	30	36	40	[illegible]	*	36
00034	L. Trans.	feet	12	12	8	7	6	9	-	8	14	7	9	8	8	8	8	9	7	8	12	10	*	11
00410	Alk., Total	mg/ℓ	25	25	30	30	25	30	30	*	39	25	25	30	25	34	25	25	50	38	59	54	*	38
00681	DOC	mg/ℓ	6.9	9.6	9.9	9.8	7.2	3.9	7.0	*	4.0	3.4	2.0	3.0	2.0	2.5	5.3	4.8	5.3	7.3	9.5	15.5	*	4.8
00680	TOC	mg/ℓ	3.0	3.4	4.4	3.2	2.2	5.4	4.4	*	3.7	4.5	2.3	4.0	3.0	4.0	8.0	8.5	8.0	7.8	9.5	6.5	*	5.6
32211	Chlorophyll, a	µg/ℓ	2	4	14	15	27	24	26	*	-	28	31	23	24	19	30	13	22	18	24	21	*	18
32212	Chlorophyll, b	µg/ℓ	≤1	1	2	2	4	3	2	*	3	3	3	2	3	2	1	3	3	2	4	3	*	3
32214	Chlorophyll, c	µg/ℓ	≤1	2	3	3	3	6	4	*	7	6	9	5	6	7	2	5	3	2	4	5	*	6
00080	Color, True	Pt. Co.	10	10	15	15	15	15	15	*	10	12	9	12	12	13	11	8	8	13	12	12	*	8
31616	Fecal Coliform	/100 ml	2900	89	<1	<1	3	<1	2	15	<1	2	<1	<1	<1	9	<1	<1	<1	<1	<1	<1	10	<1
31673	Fecal Strep.	/100 ml	19	7	11	7	19	2	2	<1	<1	<1	20	4	20	<1	10	5	1	300	390	4	2	<1
NONE	F.C./F.S. Ratio		153	13	<1	<1	<1	<1	1	15	1	2	<1	<1	<1	9	<1	<1	1	<1	<1	<1	5	1
70300	Res., Tot. Filt.	mg/ℓ	135	134	121	123	110	123	170	*	155	171	119	115	103	-	115	-	106	100	89	-	*	124
00530	Res., Tot. Nonf.	mg/ℓ	6	8	3	23	21	11	13	*	11	14	16	14	15	-	12	-	12	9	7	-	*	10
00076	Turbidity	Hach FTU	4	5	9	9	10	5	5	*	4	4	4	5	6	7	6	2	2	4	3	3	*	4

Dash (-) indicates sample not analysed.
* Station missed.

TABLE A-1 . Continued.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	7-30	7-30	7-30	7-30	7-31	7-31	8-1	8-1	8-1	8-1	8-2	8-2	8-2	8-2	8-2	8-3	8-3	8-4	8-4	8-4	8-3	8-3
		TIME	1000	1130	1340	1525	1010	1600	1800	1330	1520	1810	0935	1125	1245	1435	1650	1555	1650	0935	1230	1410		0845
		UNITS																						
70996	ATP	ng/ℓ	<50	<50	.50	80	<50	-	69	201	<50	<50	<50	<50	<50	<50	50	130	133	103	<50	77	*	76
00916	Ca, Total	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
00940	Cl	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01046	Fe, Dissolved	μg/ℓ	176	67	76	51	180	132	133	*	56	52	69	68	128	80	75	127	161	73	140	60	*	79
74010	Fe, Total	mg/ℓ	0.25	0.31	0.64	0.48	0.58	0.37	0.38	*	0.31	0.45	0.37	0.31	0.39	0.39	0.42	0.31	0.25	0.34	1.26	0.45	*	0.31
00927	Mg, Total	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01056	Mn, Dissolved	μg/ℓ	35	13	4	<4	<4	<4	<4	*	<2	<2	<2	<4	<4	<4	<4	< 4	<4	<2	<2	<2	*	<4
01055	Mn, Total	mg/ℓ	0.07	0.09	0.09	0.07	0.07	0.06	0.06	*	0.04	0.05	0.06	0.04	0.05	0.05	0.05	0.03	0.03	0.03	0.43	0.05	*	0.04
00610	NH_3	mg/ℓ	0.06	0.06	0.17	0.17	0.06	0.05	0.08	*	0.03	0.03	<0.03	0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	*	0.03
00630	NO_2-NO_3	mg/ℓ	0.53	0.55	0.54	0.53	0.53	0.31	0.25	*	0.27	0.29	0.36	0.37	0.39	0.32	0.29	0.13	0.09	<0.01	0.06	0.02	*	0.27
00625	TKN	mg/ℓ	0.3	0.2	0.3	0.4	0.3	0.3	0.3	*	1.1	0.1	0.9	0.8	0.8	0.8	0.8	0.3	0.3	0.6	0.4	0.7	*	0.2
00640	TIN, (Calc.)	mg/ℓ	0.59	0.61	0.71	0.70	0.59	0.36	0.33	*	0.30	0.32	≤0.39	0.40	≤0.42	≤0.35	≤0.32	≤0.16	≤0.12	<0.33	≤0.09	≤0.05	*	0.30
00605	TON, (Calc.)	mg/ℓ	0.2	0.1	0.1	0.2	0.2	0.3	0.2	*	1.7	0.1	0.9	0.8	0.8	0.8	0.8	0.3	0.3	0.6	0.4	0.7	*	0.2
00600	N, Total (Calc.)	mg/ℓ	0.8	0.7	0.8	0.9	0.8	0.7	0.5	*	2.0	0.4	≤1.3	1.2	≤1.2	≤1.2	≤1.1	≤0.5	≤0.4	0.6	≤0.5	≤0.8	*	0.5
00671	Diss. o-P	mg/ℓ	0.014	0.006	0.006	0.028	0.018	<0.001	0.086	*	0.009	0.005	<0.001	<0.001	<0.001	0.038	0.001	<0.001	<0.001	0.004	0.004	0.005	*	<0.001
00665	P, Total	mg/ℓ	0.02	0.02	0.02	0.05	0.03	0.02	0.02	*	0.05	0.05	0.05	0.03	0.06	0.07	0.03	0.06	0.06	0.05	0.05	0.05	*	0.04
00937	K, Total	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
00929	Na, Total	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
00946	SO_4, Dissolved	mg/ℓ	49	51	50	51	50	44	42	*	41	42	42	44	43	43	43	10	10	10	10	8	*	30
00745	S, Total	mg/ℓ	0.01	0.01	0.01	<0.01	0.01	0.02	0.01	*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	*	<0.01
01092	Zn	μg/ℓ	160	230	750	310	200	50	110	*	110	170	460	360	280	370	360	420	190	170	640	320	*	240
00405	CO_2, (Calc.)	mg/l	11	5	4	5	34	1	1	*	2	1	17	2	1	-	0.4	-	0.5	0.2	0.1	-	*	2

Dash (-) indicates sample not analysed. Dashes (--) indicate analysis not required.
* Station missed.

TABLE A-2 . Physical-Chemical measurements, Main River Stations, Middle Black Warrior-Tombigbee Rivers, August 27 - 31, 1978.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	23
		DATE	8/28	8/28	8/28	8/28	8/29	8/29	8/29	8/30	8/30	8/30	8/30	8/31	8/31	8/31	8/31	8/27	8/27	8/27	8/27	8/31	8/31
		TIME	1015	1225	1500	1605	0955	1530	1615	1130	1345	1600	1800	1020	1140	1300	1500	1000	1130	1345	1650	1815	1745
		UNITS																					
NONE	Depth	feet	13	27	22	20	25	26	-	46	23	25	30	38	35	36	48	15	15	22	40	-	45
00400	pH	S.U.	7.5	7.2	7.5	7.3	7.1	7.7	7.1	7.1	7.1	7.1	7.2	7.2	7.3	7.1	7.2	6.2	7.7	8.6	8.9	8.4	5.7
00010	Temperature	°C	27.0	26.0	30.0	30.0	29.0	27.5	27.5	28.5	27.0	27.0	29.0	26.0	30.5	28.5	31.0	27.5	28.0	31.0	32.5	28.5	30.0
00299	DO	mg/ℓ	7.2	7.1	8.6	8.6	8.4	8.6	5.9	6.5	6.8	7.6	7.0	7.3	7.5	7.2	6.7	7.3	7.6	9.0	9.1	7.6	7.2
00090	ORP	mV	400	340	330	320	320	315	350	330	330	330	330	320	320	320	330	371	320	280	250	260	325
00094	Sp. Cond.	umhos/cm	190	200	200	200	170	180	160	160	170	170	170	175	175	170	180	100	100	125	35	170	180
00077	Trans., S. D.	inches	40	49	26	25	24	28	24	25	34	26	30	36	42	42	46	26	24	-	-	36	36
00034	L. Trans.	feet	14	13	8	8	7	6	6	9	10	7	-	11	10	12	11	8	9	13	13	-	10
00410	Alk., Total	mg/ℓ	27	29	27	29	28	31	26	29	27	31	25	26	26	27	28	41	44	51	59	52	37
00681	DOC	mg/ℓ	2.6	3.6	3.4	2.3	1.5	1.5	1.8	4.6	1.9	3.2	3.8	1.4	1.1	2.5	1.9	21.6	19.3	16.2	13.9	2.8	0.5
00680	TOC	mg/ℓ	4.1	3.4	4.9	4.5	3.5	2.4	2.4	4.3	4.0	3.9	4.1	4.8	4.6	3.5	2.4	6.8	6.7	5.9	8.2	6.7	6.5
32211	Chlorophyll, a	µg/ℓ	1	3	6	26	-	28	15	13	11	11	16	13	9	-	-	5	-	12	4	-	-
32212	Chlorophyll, b	µg/ℓ	1	<1	<1	2	-	2	[illegible]	1	2	<1	1	1	1	-	-	<1	-	1	<1	-	-
32214	Chlorophyll, c	µg/ℓ	2	2	<1	5	-	6	2	1	5	4	2	2	3	-	-	<1	-	1	<1	-	-
00080	Color, True	Pt. Co.	12	12	12	11	13	13	12	13	12	13	13	13	13	13	13	11	13	13	12	13	13
31616	Fecal Coliform	/100 mℓ	9	-	<2	<1	<1	10	<1	<1	<1	10	<1	<1	7	11	<1	1	<1	<1	<1	<1	2
31673	Fecal Strep.	/100 mℓ	75	9	18	11	136	47	11	52	6	24	26	6	23	25	5	14	35	5	<1	5	40
NONE	F.C./F.S. Ratio		<1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	<1
70300	Res., Tot. Filt.*	mg/ℓ	112	124	119	111	99	108	99	147	193	170	140	88	90	100	122	86	96	72	97	103	115
00530	Res., Tot. Nonf.	mg/ℓ	5	7	12	13	25	13	10	15	12	11	17	12	9	11	8	11	9	4	8	8	8
00076	Turbidity	Hach FTU	3	4	7	8	13	10	8	9	8	7	7	6	5	6	5	8	7	3	4	5	5
00900	Hardness (Calc.)	mg/ℓ	53.1	42.8	86.9	45.0	-	45.4	37.8	41.5	38.0	36.1	40.9	41.9	40.6	41.3	44.5	47.2	50.5	49.9	53.6	57.5	51.4

Dash (-) indicates sample not analysed.

TABLE A-2 . Continued.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	23
		DATE	8/28	8/28	8/28	8/28	8/29	8/29	8/29	8/30	8/30	8/30	8/30	8/31	8/31	8/31	8/31	8/27	8/27	8/27	8/27	8/31	8/31
		TIME	1015	1225	1500	1605	0955	1530	1615	1130	1345	1600	1800	1020	1140	1300	1500	1000	1130	1345	1650	1815	1745
		UNITS																					
70996	ATP	mg/ℓ	<50	<50	<50	138	275	143	<50	64	<50	<50	<50	99	62	-	<50	<50	<50	<50	<50	83	54
00916	Ca, Total	mg/ℓ	12.5	11.1	12.1	12.1	13.9	12.1	9.7	10.7	9.7	8.8	10.4	11.1	10.4	10.8	12.2	15.8	17.6	17.1	19.0	19.9	15.1
00940	Cl	mg/ℓ	6	7	5	6	5	8	6	9	10	8	8	8	8	8	8	14	15	14	14	11	10
01046	Fe, Dissolved	μg/ℓ	38	71	36	40	23	50	37	38	32	55	46	208	75	42	27	90	33	18	75	50	43
74010	Fe, Total	mg/ℓ	0.18	0.24	0.48	0.72	0.28	0.84	0.48	0.90	0.36	0.30	0.24	0.66	0.90	0.42	0.42	1.86	0.66	0.42	0.24	0.42	0.42
00927	Mg, Total	mg/ℓ	3.2	3.4	3.4	3.3	3.2	3.3	3.1	3.2	3.2	3.2	3.2	3.2	3.1	3.3	3.2	1.1	1.3	1.5	1.4	1.7	3.0
01056	Mn, Dissolved	μg/ℓ	<8	<8	<8	<8	<8	22	<8	17	<8	22	<8	<8	<8	<8	<8	<10	16	<8	13	<8	<8
01055	Mn, Total	mg/ℓ	0.04	0.02	0.04	0.07	0.04	0.05	0.05	0.23	0.20	0.15	0.16	0.10	0.09	0.08	0.08	0.02	0.01	<0.01	0.02	0.09	0.07
00610	NH_3	mg/ℓ	0.09	0.06	0.01	0.09	0.06	0.03	0.08	0.01	0.01	0.01	0.03	0.06	0.04	0.06	0.08	0.02	<0.01	<0.01	<0.01	0.06	0.09
00630	NO_2-NO_3	mg/ℓ	0.51	0.51	0.55	0.49	0.37	0.26	0.33	0.30	0.27	0.26	0.19	0.16	0.24	0.31	0.34	0.10	0.10	0.01	<0.01	0.19	0.03
00625	TKN	mg/ℓ	0.1	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.7	0.7	0.6	0.6	0.3	0.3
00640	TIN, (Calc.)	mg/ℓ	0.60	0.57	0.56	0.58	0.43	0.29	0.41	0.31	0.28	0.27	0.22	0.22	0.28	0.37	0.42	0.12	<0.11	<0.02	0.01	0.25	0.12
00605	TON, (Calc.)	mg/ℓ	<0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.7	0.7	0.6	0.6	0.2	0.2
00600	N, Total (Calc.)	mg/ℓ	<0.7	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.4	0.5	<0.5	0.8	<0.8	0.6	0.6	0.5	0.3
00671	Diss. o-P	mg/ℓ	0.007	0.011	0.003	0.013	0.025	0.052	0.037	0.006	0.006	0.010	0.001	0.001	<0.001	<0.001	<0.001	0.014	0.011	0.003	0.009	<0.0[illegible]1	[illegible].005
00665	P, Total	mg/ℓ	0.05	0.06	0.04	0.08	0.10	0.09	0.06	0.22	0.17	0.19	0.17	0.08	0.09	0.14	0.09	0.07	0.06	0.03	0.04	0.14	0.12
00937	K, Total	mg/ℓ	1.87	1.70	1.73	1.88	[illegible]77	1.84	1.54	1.57	1.49	1.47	1.55	1.60	1.5[illegible]	1.61	1.64	1.36	1.33	1.38	1.27	1.24	1.45
00929	Na, Total	mg/ℓ	9.88	10.70	10.32	10.7[illegible]	[illegible]26	11.40	10.18	10.80	0.68	10.64	10.54	11.14	10.84	10.56	11.30	8.90	8.64	8.98	9.36	9.02	10.64
00946	SO_4, Dissolved	mg/ℓ	53	52	53	51	48	44	39	36	[illegible]6	36	38	39	41	41	41	9	8	9	10	14	31
00745	S, Total	mg/ℓ	2.1	1.6	1.6	1.7	1.0	1.6	<0.1	0.5	0.8	<0.1	1.0	-	-	-	-	2.1	1.8	1.7	1.5	-	-
01092	Zn	μg/ℓ	64	540	<50	<50	240	<50	<50	108	50	300	827	<50	64	<50	<50	<50	108	86	<50	<50	240
00405	CO_2 (Calc.)	mg/ℓ	1.5	3.3	1.5	2.6	4.5	1.2	3.8	4.0	2.6	4.5	2.8	3.2	2.4	-	-	-	-	-	-	-	-

Dash (-) indicates sample not analysed.

TABLE A-3 . Physical-Chemical measurements, Main River Stations, Middle Black Warrior-Tombigbee Rivers, October 1 - 5, 1978.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	10/2	10/2	10/2	10/2	10/2	10/2	10/3	10/3	10/3	10/3	10/3	10/4	10/4	10/4	10/4	10/1	10/1	10/1	10/5	10/5	10/5	10/4
		TIME	0850	0945	1120	1220	1430	1650	0930	1100	1220	1630	1815	1010	1200	1315	1510	1315	1150	1500	0845	1100	1230	1610
		UNITS																						
NONE	Depth	feet	25	15	23	18	21	38	34	50	35	32	32	38	38	45	39	15	12	18	35	50	55	47
00400	pH	S.U.	7.2	7.2	7.4	7.3	8.8	8.4	7.2	7.2	7.2	7.3	7.6	7.6	7.6	7.7	7.7	7.8	7.9	7.7	7.3	7.5	7.4	7.6
00010	Temperature	^oC	23.0	22.5	24.5	24.5	25.5	25.0	26.0	26.0	25.5	26.5	26.5	28.0	25.0	28.0	27.0	25.0	23.0	25.0	26.0	26.0	26.0	27.0
00299	DO	mg/ℓ	7.4	7.4	8.6	8.1	11.6	9.9	6.7	6.6	7.0	7.9	8.3	7.7	8.3	8.0	7.7	7.8	6.6	5.2	5.2	6.0	7.0	7.3
00090	ORP	mV	310	315	340	325	285	315	365	335	355	350	345	345	345	315	325	310	290	310	365	355	365	345
00094	Sp. Cond.	μmhos/cm	185	185	195	215	200	195	200	195	195	195	195	180	185	190	200	165	170	170	175	190	200	190
00077	Trans., S. D.	inches	66	60	60	48	36	34	50	48	43	37	46	51	45	48	48	48	22		34	33	50	44
00034	L. Trans.	feet	15	-	13	10	10	8	12	13	11	10	11	15	13	13	13	8	5	6	8	9	13	12
00410	Alk., Total	mg/ℓ	26	26	30	32	32	29	30	30	29	28	28	13	17	17	16	49	44	43	25	25	17	18
00681	DOC	mg/ℓ	11.4	9.4	10.1	8.4	9.4	9.2	10.3	8.3	8.3	8.0	9.6	12.7	9.6	8.9	8.5	10.5	7.2	8.0	14.1	9.8	8.5	12.0
00680	TOC	mg/ℓ	10.9	10.7	11.2	10.2	11.5	11.2	8.9	9.7	9.7	9.2	10.4	15.3	13.9	12.5	12.0	11.2	12.3	13.5	17.4	15.4	12.3	14.5
32211	Chlorophyll, a	μg/ℓ	2	3	9	8	37	24	9	12	12	11	10	8	11	4	11	8	20	15	11	23	14	14
32212	Chlorophyll, b	μg/ℓ	1	1	1	1	3	2	1	2	1	2	2	1	2	2	2	3	2	2	2	4	4	4
32214	Chlorophyll, c	μg/ℓ	3	2	3	2	7	5	3	3	2	4	6	2	2	3	4	6	2	4	2	4	12	7
00080	Color, True	Pt. Co.	10	10	10	10	10	10	12	12	12	13	12	13	13	13	13	15	10	15	14	14	13	13
31616	Fecal Coliform	/100 mℓ	3130	2610	30	13	<1	<1	<1	150	<1	<1	<1	*	*	*	<1	7	13	2	<1	miss	2	7
31673	Fecal Strep.	/100 mℓ	220	30	25	4	22	250	6	20	10	200	48	6	80	82	13	31	24	55	12	miss	351	6
NONE	F C./F.S. Ratio		14	87	1	3	<1	<1	<1	8	<1	<1	<1	-	-	-	<1	<1	<1	<1	<1	miss	<1	1
70300	Res., Tot. Filt.	mg/ℓ	105	112	114	110	114	107	120	114	111	109	101	117	121	111	111	129	118	118	98	110	105	123
00530	Res., Tot. Nonf.	mg/ℓ	5	1	2	9	12	10	1	4	3	6	4	<1	3	2	4	4	14	9	10	7	1	2
00076	Turbidity	Hach FTU	3	3	3	4	5	6	3	2	2	3	2	2	3	2	2	3	9	9	6	4	3	2

Asterisk (*) indicates too many to count.

TABLE A-3 . Continued.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	10/2	10/2	10/2	10/2	10/2	10/2	10/3	10/3	10/3	10/3	10/3	10/4	10/4	10/4	10/4	10/1	10/1	10/1	10/5	10/5	10/5	10/4
		TIME	0850	0945	1120	1220	1430	1650	0930	1100	1220	1630	1815	1010	1200	1315	1510	1315	1150	1500	0845	1100	1230	1610
		UNITS																						
[illegible]	ATP	ng/ℓ	<50	67	100	<50	114	94	63	77	<50	<50	51	54	<50	<50	<50	66	83	144	<50	-	-	100
[illegible]	Ca, Total	mg/ℓ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
00940	Cl	mg/ℓ	4	4	5	9	6	5	7	[illegible]	7	7	7	8	8	8	7	12	11	9	12	11	8	8
01046	Fe, Dissolved	μg/ℓ	34	37	16	25	37	24	19	12	13	28	11	41	5	35	21	24	11	28	39	19	36	8
74010	Fe, Total	mg/ℓ	0.37	0.49	0.37	8.02	0.70	0.33	0.45	0.33	0.53	0.82	0.37	0.53	0.37	0.28	0.45	0.33	0.66	0.95	0.66	0.78	0.45	0.41
00927	Mg, Total	mg/ℓ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
01056	Mn, Dissolved	μg/ℓ	36	17	7	6	6	12	7	9	11	9	5	7	11	16	8	10	7	8	10	11	8	8
01055	Mn, Total	mg/ℓ	0.10	0.25	0.20	0.20	0.10	0.05	0.01	0.20	0.10	0.10	0.05	0.10	0.05	0.34	0.24	0.25	0.05	0.10	0.25	0.10	0.12	0.01
00610	NH_3	mg/ℓ	0.11	0.11	0.04	0.14	0.05	0.10	0.06	0.05	0.05	0.04	0.02	0.03	0.03	0.03	0.02	0.05	0.01	0.05	0.02	0.02	0.02	0.02
00630	NO_2-NO_3	mg/ℓ	0.33	0.40	0.36	0.41	0.36	0.30	0.20	0.17	0.16	0.20	0.33	0.26	0.36	0.28	0.33	0.07	0.03	0.09	0.08	0.10	0.26	0.28
00625	TKN	mg/ℓ	0.4	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.5	0.4	0.3	0.2	0.3	0.3	0.2	0.4	0.4	0.5	0.2	0.2	0.2	0.3
00640	TIN, (Calc.)	mg/ℓ	0.44	0.51	0.40	0.55	0.41	0.40	0.26	0.22	0.21	0.24	0.35	0.29	0.39	0.31	0.35	0.12	0.04	0.14	0.10	0.12	0.28	0.30
00605	TON, (Calc.)	mg/ℓ	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.2	0.3	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.4	0.4	0.1	0.1	<0.1	<0.1
00600	N, Total (Calc.)	mg/ℓ	0.4	0.5	0.4	0.5	0.5	0.5	0.4	0.4	0.5	0.4	0.4	0.3	0.4	0.3	0.4	0.4	0.4	0.2	0.2	0.2	0.3	0.3
00671	Diss. o-P	mg/ℓ	0.010	0.017	0.002	0.004	0.003	0.002	0.003	0.001	0.002	0.007	0.001	0.007	0.004	0.009	0.007	0.012	0.050	0.043	0.003	0.003	0.002	0.005
00665	P, Total	mg/ℓ	0.05	0.05	0.01	0.06	0.05	0.07	0.03	0.01	0.01	0.02	0.01	0.04	0.06	0.05	0.04	0.08	0.07	0.08	0.03	0.13	0.01	0.06
00937	K, Total	mg/ℓ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
00929	Na, Total	mg/ℓ	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-
00946	SO_4, Dissolved	mg/ℓ	46	44	36	43	34	42	40	36	39	41	36	41	38	40	36	6	9	5	[illegible]	[illegible]	40	[illegible]
00745	S, Total	mg/ℓ	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	[illegible]	[illegible]	[illegible]
01092	Zn	μg/ℓ	32	141	24	896	66	485	99	242	116	124	242	91	91	57	74	50	57	74	66	[illegible]	[illegible]	[illegible]
00405	CO_2 (Calc.)	mg/ℓ	3.0	3.0	2.2	2.8	<0.1	0.2	3.6	3.6	3.4	2.6	1.3	0.6	0.8	0.6	0.6	1.5	1.1	1.7	2.6	1.5	1.3	[illegible]

Dash (-) indicates analysis not required.

TABLE A-4 . Physical-Chemical measurements, Main River Stations, Middle Black Warrior-Tombigbee Rivers, December 10 - 14, 1978.

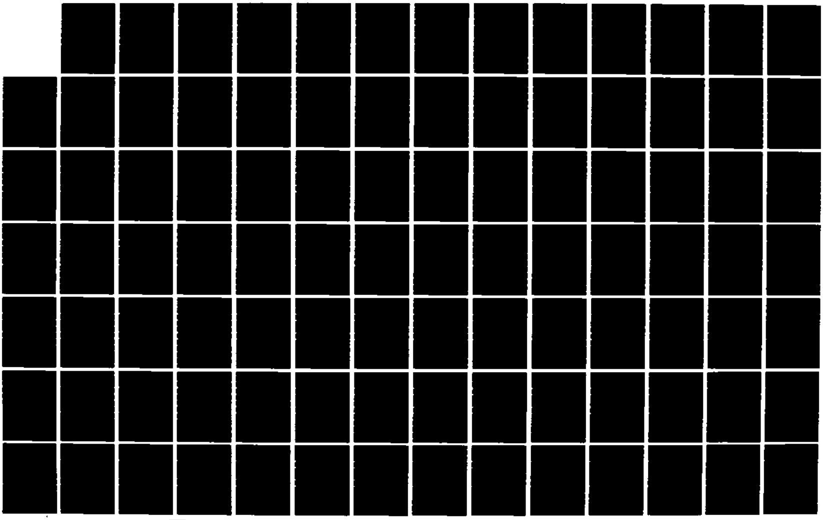
STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	12/11	12/11	12/12	12/12	12/12	12/12	12/12	12/12	12/13	12/13	12/13	12/13	12/13	12/13	12/14	12/10	12/10	12/10	12/10	12/14	12/14	12/14
		TIME	1310	1430	0900	1020	1227	1423	1525	1558	0810	0945	1118	1248	1350	1500	130C	1045	1220	1350	1540	1410	1115	1000
		UNITS																						
NONE	Depth	feet	24	20	22	16	24	39	30	48	25	26	36	40	40	45	50	16	19	24	**	47	54	44
00400	pH	S.U.	7.4	7.6	7.4	7.5	7.5	7.4	7.3	7.2	7.0	*	*	*	*	*	*	7.1	*	*	**	*	*	*
00010	Temperature	°C	10.0	11.5	11.0	11.0	10.5	12.5	12.5	12.0	9.5	12.0	10.5	12.0	14.5	13.0	12.5	7.5	*	*	**	10.0	10.5	9.0
00299	DO	mg/l	10.6	10.8	10.9	10.6	10.9	11.0	9.8	9.5	10.0	11.4	10.9	10.2	10.4	10.2	10.3	11.0	*	*	**	9.6	9.8	10.4
00090	ORP	mV	310	320	330	320	320	230	310	310	360	300	330	340	290	290	310	270	*	*	**	290	270	330
00094	Sp. Cond	umhos/cm	290	200	200	205	190	[illegible]	165	170	170	170	170	160	160	165	165	115	*	*	**	130	140	140
00077	Trans., S. D.	inches	29	23	18	19	12	12	11	11	13	11	13	21	17	24	25	13	11	10	**	11	15	13
[illegible]	L. Trans.	feet	8	8	5	5	3	4	4	4	5	5	4	7	7	8	8	5	3	3	**	3	4	4
00410	Alk., Total	mg/l	25	27	27	26	23	22	22	22	22	22	22	22	24	23	-	21	27	32	**	-	-	-
00681	DOC	mg/l	4.8	4.6	2.9	2.4	2.5	3.3	3.0	2.9	6.3	5.6	5.0	4.0	3.7	4.0	7.3	8.0	8.4	7.5	**	8.3	7.9	7.9
00680	TOC	mg/l	5.9	10.7	4.4	3.6	4.2	5.3	6.1	5.6	6.7	7.2	5.5	5.1	8.0	6.6	6.7	9.5	10.3	11.7	**	8.9	7.7	9.0
[illegible]	Chlorophyll, a	µg/l	2	1	1	1	<1	1	2	<1	1	<1	2	2	-	4	<1	2	2	<1	**	2	2	1
32212	Chlorophyll, b	µg/l	1	<1	<1	1	<1	1	1	<1	1	<1	1	1	-	1	1	2	1	2	**	1	1	1
32214	Chlorophyll, c	µg/l	5	2	2	4	1	2	6	2	3	2	3	3	-	4	3	4	2	2	**	3	2	2
00080	Color, True	Pt. Co.	16	18	17	20	19	23	24	25	16	16	15	15	14	14	34	45	44	54	**	55	43	48
31616	Fecal Coliform	/100 ml	145	220	165	116	208	210	350	360	164	208	217	73	84	51	29	51	810	1030	**	264	296	327
[illegible]	Fecal Strep	/100 ml	135	106	56	33	120	250	230	320	76	58	59	33	46	25	12	63	980	1260	**	227	220	330
[illegible]	F.C./F.S. Ratio		1	2	3	4	2	1	2	1	2	4	4	2	2	2	2	1	1	1	**	1	1	1
70300	Res., Tot. Filt.	mg/l	126	118	113	98	99	87	75	81	94	114	104	95	74	71	111	67	66	74	**	122	112	110
00530	Res., Tot. Nonf.	mg/l	13	17	27	28	54	26	29	29	24	23	21	15	15	12	10	19	71	41	**	16	17	19
[illegible]	Turbidity	Hach FTU	18	18	33	32	61	47	64	55	51	47	41	25	27	27	21	12	73	65	**	64	44	52

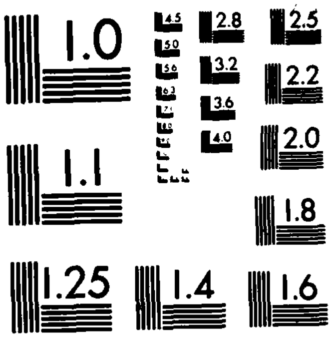
** [illegible]
*Instrument Malfunction

Dash (-) indicates sample not analysed.

AD-A131 693 WATER QUALITY MANAGEMENT STUDIES MIDDLE BLACK WARRIOR AND LOWER TOMBIGBEE..(U) HARMON ENGINEERING AND TESTING CO INC AUBURN AL APR 83 DACW01-78-C-0181 3/6

UNCLASSIFIED F/G 13/2 NL





MICROCOPY RESOLUTION TEST CHART
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TABLE A-4 . Continued.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	12/11	12/11	12/12	12/12	12/12	12/12	12/12	12/12	12/13	12/13	12/13	12/13	12/13	12/13	12/14	12/10	12/10	12/10		12/14	12/14	12/14
		TIME	1310	1430	0900	1020	1227	1423	1525	1558	0810	0945	1118	1248	1350	1500	1300	1045	1220	1350		1410	1115	1000
		UNITS																						
70996	ATP	ng/ℓ	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	**	<50	<50	<50
00916	Ca, Total	mg/ℓ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**	-	-	-
00940	Cl	mg/ℓ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**	-	-	-
01046	Fe, Dissolved	µg/ℓ	53	47	61	62	50	140	153	66	142	159	126	193	151	133	152	390	520	370	**	167	134	134
74010	Fe, Total	mg/ℓ	0.75	1.59	1.59	0.62	1.55	1.21	1.70	2.36	0.88	1.60	0.75	0.71	0.60	0.37	0.52	2.80	1.82	2.27	**	1.32	1.28	1.65
00927	Mg, Total	mg/ℓ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**	-	-	-
01056	Mn, Dissolved	µg/ℓ	214	254	310	268	392	173	120	120	76	63	90	35	8	8	5	22	27	2	**	3	4	3
01055	Mn, Total	mg/ℓ	0.25	0.31	0.42	0.35	0.56	0.23	0.17	0.20	0.16	0.15	0.09	0.06	0.06	0.04	0.02	0.12	0.12	0.17	**	0.04	0.03	0.04
00610	NH_3	mg/ℓ	0.07	0.05	0.01	0.06	0.05	0.05	0.07	0.08	0.10	0.09	0.16	0.14	0.16	0.17	0.19	0.12	0.07	0.05	**	0.15	0.12	0.14
00630	NO_2-NO_3	mg/ℓ	0.45	0.41	0.46	0.46	0.58	0.48	0.41	0.41	0.43	0.44	0.44	0.45	0.46	0.45	0.41	0.22	0.24	0.33	**	0.39	0.34	0.33
00625	TKN	mg/ℓ	0.3	0.2	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.2	0.4	0.3	0.4	0.4	0.5	0.4	0.2	0.5	**	0.4	0.4	0.4
00640	TIN, (Calc.)	mg/ℓ	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.3	0.3	0.4	**	0.5	0.5	0.5
00605	TON, (Calc.)	mg/ℓ	0.2	0.2	0.3	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.5	**	0.2	0.4	0.3
00600	N, Total (Calc.)	mg/ℓ	0.7	0.7	0.8	0.7	0.9	0.7	0.7	0.7	0.7	0.6	0.8	0.8	0.8	0.8	0.9	0.6	0.5	0.9	**	0.7	0.9	0.8
00671	Diss. o-P	mg/ℓ	0.017	0.010	0.006	0.017	0.012	0.010	0.021	0.011	0.034	0.013	0.020	0.020	0.018	0.030	0.045	0.053	0.048	0.030	**	0.068	0.051	0.058
00665	P, Total	mg/ℓ	0.04	0.04	0.04	0.07	0.07	0.05	0.08	0.05	0.14	0.13	0.13	0.14	0.11	0.12	0.10	0.16	0.16	0.14	**	0.21	0.17	0.20
00937	K, Total	mg/ℓ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**	-	-	-
00929	Na, Total	mg/ℓ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**	-	-	-
00946	SO_4, Dissolved	mg/ℓ	50	51	48	51	51	43	40	38	39	38	36	32	32	30	28	8	8	8	**	5	15	12
00745	S, Total	mg/ℓ	0.1	0.1	0.2	0.2	0.1	0.4	0.2	0.2	0.1	0.1	0.2	<0.1	0.2	0.2	0.3	0.6	0.4	0.3	**	1.1	1.1	0.3
01092	Zn	µg/ℓ	42	52	62	52	52	52	71	100	50	33	62	24	24	43	31	85	62	43	**	52	43	48
00405	CO_2, (Calc.)	mg/ℓ	2.6	1.6	2.6	1.8	1.5	1.7	1.7	3.3	4.6	*	*	*	*	*	*	4.3	*	*	**	*	*	*

Dash (-) indicates analysis not required. * Instrument malfunction.
** Station missed.

TABLE A-5. Physical-Chemical measurements, Main River Stations, Middle Black Warrior-Tombigbee Rivers, February 27 - March 2, 1979.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	[illegible]	14	15	16	17	18	19	20	21	22	23
		DATE	3/1	3/1	3/1	3/1	2/28	2/28	2/28	2/28	2/28	2/26	2/26	2/26	2/26	2/26	2/26	2/27	2/27	2/27	2/27	2/27	2/27	2/27
		TIME	0918	0955	1322	1405	0940	1134	1230	1316	1355	0937	1246	1350	1435	1522	1615	0830	1020	1216	1350	1535	1705	1630
		UNITS																						
NONE	Depth	feet	39	32	32	39	23	46	39	49	28	46	49	52	62	62	66	39	46	39	52	59	72	62
00400	pH	S.U.	6.2	6.5	7.1	6.9	7.2	6.9	6.8	6.7	6.7	6.7	6.8	6.8	6.9	6.9	6.9	7.5	7.5	7.6	7.7	7.6	7.1	7.2
00010	Temperature	°C	10.0	10.0	11.0	10.0	11.0	10.0	9.5	10.0	9.5	7.5	9.0	9.0	9.5	9.5	-	10.5	10.5	12.5	12.0	13.0	-	10.5
00299	DO	mg/ℓ	11.5	11.5	11.4	11.6	11.3	11.1	11.2	11.1	11.1	11.8	11.6	11.0	11.0	11.2	11.0	9.8	9.4	9.2	9.2	9.2	9.8	10.1
00090	ORP	mV	450	430	400	420	390	410	410	430	420	440	410	420	411	390	390	400	390	390	375	370	400	400
00094	Sp. Cond.	umhos/cm	155	155	160	140	160	140	140	140	135	150	150	150	150	160	155	110	110	110	120	120	130	130
00077	Trans., S. D.	inches	18	18	21	16	20	16	14	12	12	8	6	6	6	7	6	4	4	4	4	4	5	6
00034	L. Trans.	feet	6	6	6	4	6	4	4	3	3	2	2	2	2	2	2	1	1	1	1	1	2	2
00410	Alk., Total	mg/ℓ	20	20	21	21	18	17	17	17	17	18	18	19	20	21	21	40	40	41	42	41	25	30
00681	DOC	mg/ℓ	5	4	5	6	3	4	3	3	3	4	8	5	7	5	3	7	6	7	8	6	4	5
00680	TOC	mg/ℓ	4	4	3	4	4	5	4	4	5	3	4	5	4	5	4	17	19	18	17	14	10	10
32211	Chlorophyll, a	µg/ℓ	1	1	1	1	2	1	1	1	1	3	1	3	2	2	1	3	3	3	4	2	3	4
32212	Chlorophyll, b	µg/ℓ	<1	1	1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1	<1	1	<1	1	1	1	1
32214	Chlorophyll, c	µg/ℓ	3	3	4	2	1	<1	2	1	3	2	1	3	3	1	1	2	4	3	3	4	3	4
00080	Color, True	Pt. Co.	18	17	17	17	23	23	20	20	20	24	24	24	25	26	26	56	55	55	53	55	25	38
31616	Fecal Coliform	/100 mℓ	36	89	78	280	94	40	60	114	120	122	257	238	391	284	227	1800	3620	1030	650	1130	545	563
31673	Fecal Strep.	/100 mℓ	82	69	79	145	85	137	97	62	62	130	85	112	103	92	92	900	1180	1030	1690	890	640	880
NONE	F.C./F.S. Ratio		<1	1	1	2	1	<1	<1	2	2	1	3	2	4	3	2	2	3	1	<1	1	<1	<1
70300	Res., Tot. Filt.	mg/ℓ	109	104	104	123	96	91	92	94	81	89	90	93	96	73	99	107	125	106	116	131	102	109
00530	Res., Tot. Nonf.	mg/ℓ	11	12	18	20	31	40	35	40	40	176	166	217	164	151	154	255	242	308	330	221	126	166
00076	Turbidity	Hach FTU	18	18	18	20	23	25	26	28	27	133	160	170	170	149	150	195	180	180	180	135	80	95
00900	Hardness (Calc.)	mg/ℓ	45.2	44.2	49.8	45.2	43.1	41.4	40.2	35.9	35.9	54.6	50.5	54.4	54.7	50.7	53.6	63.5	59.6	67.6	68.7	59.4	52.3	50.5

Dash (-) indicates measurement not taken.

TABLE A-5 . Continued.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	3/1	3/1	3/1	3/1	2/28	2/28	2/28	2/28	2/28	2/26	2/26	2/26	2/26	2/26	2/26	2/27	2/27	2/27	2/27	2/27	2/27	2/27
		TIME																						
		UNITS																						
70996	ATP	ng/ℓ	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
00916	Ca, Total	mg/ℓ	7.0	6.5	8.4	6.2	6.3	5.5	5.7	4.1	4.3	3.4	5.3	3.7	4.1	4.8	4.7	8.3	7.5	8.1	9.8	11.4	5.9	5.9
00940	Cl	mg/ℓ	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	3	3
01046	Fe, Dissolved	µg/ℓ	70	28	146	165	193	185	244	219	219	200	249	180	180	303	200	335	882	298	195	293	357	190
74010	Fe, Total	mg/ℓ	0.84	1.06	0.70	1.06	1.61	2.33	1.70	1.61	2.42	10.10	5.69	9.51	8.78	6.42	8.33	16.32	15.32	18.04	16.59	11.14	10.32	9.60
00927	Mg, Total	mg/ℓ	6.33	6.33	6.67	6.74	5.79	5.52	5.45	5.38	4.91	6.78	6.47	6.77	6.64	6.40	6.33	3.18	3.07	3.45	3.43	2.66	4.43	4.40
01056	Mn, Dissolved	µg/ℓ	307	371	339	307	227	243	179	243	211	419	307	371	371	371	339	18	12	7	9	8	179	179
01055	Mn, Total	mg/ℓ	0.38	0.21	0.32	0.42	0.33	0.32	0.26	0.28	0.33	0.46	0.23	0.40	0.72	0.51	0.48	0.26	0.41	0.36	0.22	0.29	0.36	0.17
00610	NH_3	mg/ℓ	0.17	0.15	0.14	0.17	0.16	0.11	0.14	0.18	0.15	0.20	0.21	0.36	0.22	0.23	0.22	0.04	0.01	0.03	0.03	0.04	0.08	0.09
00630	NO_2-NO_3	mg/ℓ	0.77	0.78	0.83	0.86	0.68	0.66	0.66	0.65	0.64	0.71	0.68	0.72	0.71	0.71	0.73	0.24	0.20	0.24	0.29	0.35	0.44	0.45
00625	TKN	mg/ℓ	0.3	0.4	0.1	0.1	0.4	0.2	0.3	0.1	0.6	0.3	0.9	0.9	1.0	0.2	0.7	1.6	0.9	1.6	1.8	1.3	1.0	1.1
00640	TIN, (Calc.)	mg/ℓ	0.94	0.93	0.97	1.03	0.84	0.77	0.80	0.83	0.79	0.91	0.89	1.08	0.93	0.94	0.95	0.28	0.21	0.27	0.28	0.39	0.52	0.54
00605	TON, (Calc.)	mg/ℓ	0.1	0.2	<0.1	<0.1	0.2	0.1	0.2	<0.1	0.4	0.1	0.7	0.5	0.8	<0.1	0.5	1.6	0.9	1.6	1.3	1.3	0.9	1.0
00600	N, Total (Calc.)	mg/ℓ	1.0	1.1	1.0	1.0	1.0	0.9	1.0	0.8	1.2	1.0	1.6	1.6	1.7	0.9	1.5	1.9	1.1	1.9	2.1	1.7	1.4	1.5
00671	Diss. o-P	mg/ℓ	0.019	0.032	0.027	0.016	0.014	0.017	0.021	0.011	0.010	0.018	0.033	0.021	0.021	0.040	0.026	0.063	0.056	0.070	0.046	0.039	0.024	0.029
00665	P, Total	mg/ℓ	0.07	0.08	0.07	0.08	0.07	0.10	0.06	0.05	0.10	0.12	0.16	0.19	0.21	0.16	0.18	0.42	0.41	0.43	0.45	0.33	0.26	0.27
00937	K, Total	mg/ℓ	2.22	2.28	2.20	2.36	2.22	2.40	2.28	2.32	2.24	3.20	2.71	3.02	2.98	2.78	2.82	3.25	3.32	3.48	3.52	2.94	2.98	3.17
00929	Na, Total	mg/ℓ	7.84	7.28	7.77	7.70	7.12	7.31	7.40	7.05	6.46	7.34	6.83	7.44	7.38	7.28	6.98	5.36	2.55	2.89	3.68	3.72	5.03	5.03
00946	SO_4, Dissolved	mg/ℓ	35	35	36	36	33	29	33	29	29	35	35	35	35	33	33	9	11	9	10	11	22	18
00745	S, Total	mg/ℓ	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
01092	Zn	µg/ℓ	<40	<40	<40	<40	<40	54	<40	<40	64	<40	<40	64	<40	<40	<40	54	<40	54	72	64	<40	<40
00405	CO_2 (Calc.)	mg/ℓ	32	16	4	7	3	5	7	8	8	9	7	7	6	8	8	3	3	2	2	2	5	5

TABLE A-6 . Physical-Chemical measurements, Main River Stations, Middle Black Warrior-Tombigbee Rivers, May 13 - 16, 1979.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	5/14	5/14	5/14	5/14	5/14	5/15	5/15	5/15	5/15	5/15	5/16	5/16	5/16	5/16	5/16	5/13	5/13	5/13	5/13	5/13	5/16	5/16
		TIME	1015	1100	1215	1300	1500	0950	1205	1300	1430	1700	1700	1510	1415	1310	1145	1050	1220	1415	1645	1815	0825	1000
		UNITS																						
NONE	Depth	feet	24	16	25	18	48	32	31	39	23	30	71	72	29	74	43	17	72	30	45	45	52	49
00400	pH	S.U.	6.9	6.9	6.9	6.9	6.9	6.8	6.8	6.8	6.8	6.8	6.9	6.8	6.8	6.8	6.9	6.8	7.4	8.2	7.2	7.9	7.2	7.2
00010	Temperature	°C	19.5	19.5	19.5	19.5	20.0	20.0	21.0	21.0	21.0	21.0	21.5	22.0	22.5	22.5	22.0	21.5	21.0	21.0	21.0	21.5	22.0	22.0
00299	DO	mg/ℓ	9.6	9.6	9.1	9.1	9.1	8.7	8.8	8.3	8.4	9.3	8.9	8.8	8.8	8.8	9.1	7.9	7.8	7.2	7.2	7.3	7.7	7.6
00090	ORP	mV	400	420	410	410	410	410	410	420	425	430	420	410	410	410	390	420	390	350	350	370	420	380
00094	Sp. Cond.	μmhos/cm	120	120	135	135	130	120	135	130	135	140	135	140	140	140	145	100	100	100	100	110	130	135
00077	Trans., S. D.	meters	0.9	1.0	0.4	0.4	0.4	0.5	0.6	0.6	0.8	0.6	0.6	0.7	0.8	Missed	0.8	0.3	0.2	0.1	0.1	0.3	0.3	0.3
00034	L. Trans.	feet	2.0	2.0	1.1	1.2	1.2	1.4	1.8	1.8	1.8	1.7	1.8	1.9	1.9	2.1	1.7	0.8	0.5	0.2	0.3	0.5	0.9	0.9
00410	Alk., Total	mg/ℓ	18	18	19	18	19	18	18	19	19	19	20	21	22	21	22	33	36	43	51	49	35	37
00681	DOC	mg/ℓ	4.1	2.9	2.9	2.3	2.5	3.8	5.4	4.1	4.7	5.1	3.7	4.9	5.3	5.1	3.6	6.1	6.0	6.5	7.0	4.7	6.1	4.8
00680	TOC	mg/ℓ	3.3	2.3	3.7	3.3	3.9	3.8	8.7	1.8	3.9	3.0	4.3	4.3	5.5	5.3	4.0	5.0	7.8	10.4	8.9	7.0	6.7	7.2
32211	Chlorophyll, a	μg/ℓ	2	2	2	2	3	3	4	3	3	5	7	5	4	6	7	4	8	5	6	3	4	5
32212	Chlorophyll, b	μg/ℓ	2	<1	1	1	<1	1	1	<1	1	1	1	<1	1	1	1	1	2	2	1	1	1	1
32214	Chlorophyll, c	μg/ℓ	8	2	2	4	2	3	2	<1	2	2	2	2	3	2	4	2	4	6	2	2	4	3
00080	Color, True	Pt. Co.	20	18	20	22	19	30	24	20	25	27	10	15	15	24	18	54	40	67	45	53	35	35
31616	Fecal Coliform	/100 ml	1040	540	360	1410	310	83	40	43	25	32	13	7	10	10	10	71	1540	3480	4380	647	86	93
31673	Fecal Strep.	/100 ml	28	29	390	380	79	55	35	31	25	26	49	38	24	15	15	118	1810	3720	2620	1120	194	315
NONE	F.C./F.S. Ratio		37.1	18.6	0.9	3.7	3.9	1.5	1.1	1.4	1.0	1.2	0.3	0.2	0.4	0.7	0.7	0.6	0.9	0.9	1.7	0.6	0.4	0.3
70300	Res., Tot. Filt.	mg/ℓ	84	62	85	89	73	93	98	99	89	20	108	108	113	903	109	76	57	92	90	80	113	105
00530	Res., Tot. Nonf.	mg/ℓ	11	12	26	26	28	28	25	20	17	22	23	13	16	15	25	38	97	274	176	70	50	50
00076	Turbidity	Hach FTU	12	10	22	22	21	18	19	16	18	22	15	10	11	11	12	34	62	124	90	46	38	35
00900	Hardness (Calc.)	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Dash (--) indicates analysis not required.

TABLE A-6 . Continued.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	5/14	5/14	5/14	5/14	5/14	5/15	5/15	5/15	5/15	5/15	5/16	5/16	5/16	5/16	5/16	5/13	5/13	5/13	5/13	5/13	5/16	5/16
		TIME	1015	1100	1215	1300	1500	0950	1205	1300	1430	1700	1700	1510	1415	1310	1145	1050	1220	1415	1645	1815	0825	1000
		UNITS																						
70986	ATP	ng/ℓ	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
00916	Ca, Total	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
00940	Cl	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01046	Fe, Dissolved	µg/ℓ	150	<70	<70	90	130	<70	250	90	90	<70	420	130	170	<70	210	640	660	460	330	460	310	250
74010	Fe, Total	mg/ℓ	0.66	0.66	1.74	1.48	1.58	1.28	1.00	1.16	0.82	1.16	0.90	0.82	0.74	0.82	0.82	2.85	5.46	9.18	7.70	3.88	1.69	2.24
00927	Mg, Total	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01056	Mn, Dissolved	µg/ℓ	237	305	340	360	320	280	240	320	280	280	230	240	240	340	125	22	11	<10	<10	<10	59	35
01055	Mn, Total	mg/ℓ	.20	0.24	0.32	0.24	.43	.31	.33	.35	.27	.32	.25	.20	.25	.23	.19	.11	.14	.17	.13	.04	.25	.08
00610	NH_3	mg/ℓ	0.12	0.14	0.10	0.10	0.12	0.14	0.13	0.15	0.14	0.13	0.16	0.12	0.12	0.15	0.16	0.13	0.11	0.12	0.10	0.11	0.14	0.10
00630	NO_2-NO_3	mg/ℓ	0.66	0.64	0.67	0.74	0.68	0.68	0.65	0.65	0.66	0.62	0.69	0.70	0.73	0.78	0.73	0.20	0.20	0.19	0.23	0.24	0.64	0.62
00625	TKN	mg/ℓ	0.8	1.1	0.8	0.8	0.4	0.6	1.0	0.6	0.6	0.4	1.2	1.1	0.8	0.8	1.7	1.2	1.0	1.7	0.9	1.1	1.6	1.3
00640	TIN, (Calc.)	mg/ℓ	0.78	0.78	0.77	0.84	0.80	0.82	0.78	0.80	0.80	0.75	0.85	0.82	0.85	0.93	0.89	0.33	0.31	0.31	0.33	0.35	0.78	0.72
00605	TON, (Calc.)	mg/ℓ	0.7	1.0	0.7	0.7	0.3	0.5	0.9	0.4	0.5	0.3	1.0	1.0	0.7	0.6	1.5	1.1	0.9	1.6	0.8	1.0	1.5	1.2
00600	N, Total (Calc.)	mg/ℓ	1.5	1.8	1.5	1.5	1.1	1.3	1.7	1.2	1.3	1.1	1.8	1.8	1.5	1.5	2.4	1.4	1.2	1.9	1.1	1.4	2.3	1.9
00671	Diss. o-P	mg/ℓ	0.026	0.019	0.018	0.037	0.025	0.023	0.024	0.023	0.032	0.034	0.028	0.028	0.027	0.031	0.018	0.056	0.272	0.062	0.062	0.052	0.050	0.042
00665	P, Total	mg/ℓ	0.03	0.05	0.07	0.08	0.08	0.05	0.06	0.10	0.14	0.05	0.06	0.22	0.04	0.14	0.04	0.132	0.19	0.25	0.20	0.16	0.114	0.17
00937	K, Total	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
00929	Na, Total	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
00946	SO_4, Dissolved	mg/ℓ	30	30	31	31	28	26	30	28	28	30	31	31	33	35	33	7	7	6	7	7	20	16
00745	S, Total	mg/ℓ	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
01092	Zn	µg/ℓ	60	40	60	100	80	90	40	40	40	<40	<40	60	80	80	120	70	40	80	40	100	<40	<40
00405	CO_2 (Calc.)	mg/ℓ	4	4	5	5	5	6	6	6	6	**	5	6	7	**	5	10	3	1	6	1	4	5

Asterisk (*) indicates results invalid. Dash (--) indicates analysis not required.
Asterisks (**) indicate omitted data due to questionable total filterable residue values for these two stations.

TABLE A-7. Physical-chemical measurements, Main River Stations, Middle Black Warrior-Tombigbee Rivers, June 17 - 20, 1979.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23	20B**
		DATE	6/19	6/19	6/19	6/19	6/19	6/20	6/20	6/20	6/20	6/20	6/18	6/18	6/18	6/18	6/18	6/17	6/17	6/17	6/17	6/17	6/18	6/18	6/17
		TIME	0930	1025	1215	1300	1530	0945	1205	1310	1440	1620	1630	1430	1325	1230	1130	1000	1120	1330	1530	1745	1000	0815	1531
		UNITS																							
NONE	Depth	feet	23	15	26	17	26	35	34	41	23	28	38	28	34	44	38	16	16	23	43	49	52	53	43
00400	pH	S.U.	6.9	7.0	6.9	6.9	7.1	7.1	7.1	6.9	7.0	7.1	7.4	7.2	7.2	7.2	7.2	7.1	7.4	7.5	8.0	7.3	7.2	7.1	7.2
00010	Temperature	°C	25.0	25.5	26.5	26.5	27.5	27.0	27.0	27.5	27.5	27.5	27.5	27.5	29.0	28.0	27.5	26.0	25.5	27.0	28.0	26.5	27.5	27.0	26.0
00299	DO	mg/ℓ	7.4	7.9	7.8	7.8	9.3	8.3	8.0	7.9	8.1	8.2	9.0	8.4	8.3	8.3	7.8	7.8	7.1	***	***	***	8.2	9.4	***
00090	ORP	mV	420	400	400	405	390	410	410	440	440	430	380	380	380	380	380	390	370	350	330	380	360	365	370
00094	Sp. Cond.	μmhos/cm	205	205	205	210	190	190	185	180	180	180	170	165	170	160	160	120	120	120	130	125	150	150	130
00077	Trans., S. D.	meters	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0.5	0.4	0.3	0.4	0.3	*	*	--
00034	L. Trans.	feet	8	8	4	4	7	7	9	8	9	9	8	8	9	8	8	3	3	3	3	3	6	5	--
00410	Alk., Total	mg/ℓ	28	28	28	28	28	27	26	26	26	26	25	25	26	26	27	40	42	42	44	42	30	34	43
00681	DOC	mg/ℓ	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
00680	TOC	mg/ℓ	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
32211	Chlorophyll, a	μg/ℓ	2	3	6	10	16	9	6	6	7	6	8	9	7	8	8	4	7	12	29	16	9	9	--
32212	Chlorophyll, b	μg/ℓ	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	2	2	2	5	3	2	2	--
32214	Chlorophyll, c	μg/ℓ	2	2	2	2	4	3	2	6	2	2	1	2	3	3	3	4	3	4	5	3	4	5	--
00080	Color, True	Pt. Co.	15	12	19	20	14	10	10	11	13	10	10	11	13	10	16	15	25	23	19	17	22	21	18
31616	Fecal Coliform	/100 mℓ	690	530	144	75	27	11	4	7	10	8	1	5	2	1	1	<10	10	<10	<10	10	6	<10	--
31673	Fecal Strep.	/100 mℓ	500	24	53	52	16	180	54	205	5	36	69	12	67	15	99	155	150	30	30	60	8	50	--
NONE	F.C./F.S. Ratio		1	22	3	1	2	<1	<1	<1	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	--
70300	Res., Tot. Filt.	mg/ℓ	138	148	146	136	123	138	112	109	108	120	108	118	117	115	110	91	94	102	107	110	116	121	110
00530	Res., Tot. Nonf.	mg/ℓ	12	11	32	28	22	21	12	13	10	14	9	14	11	12	11	17	33	28	22	25	16	14	17
00076	Turbidity	Hach FTU	9	6	18	22	13	12	8	8	7	8	5	8	8	8	8	20	27	25	25	24	15	15	26
00900	Hardness (Calc.)	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NOTES: Dash (--) indicates analysis not required.

* Secchi disc lost 6/18/79.
** 20B is a bottom sample.
*** Abberant D. O. measurements due to damaged probe membrane.

TABLE A-7. Physical-chemical measurements, Main River Stations, Middle Black Warrior-Tombigbee Rivers, June 17 - 20, 1979.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23	208**
		DATE	6/19	6/19	6/19	6/19	6/19	6/20	6/20	6/20	6/20	6/20	6/18	6/18	6/18	6/18	6/18	6/17	6/17	6/17	6/17	6/17	6/18	6/18	6/17
		TIME	0930	1025	1215	1300	1530	0945	1205	1310	1440	1620	1630	1430	1325	1230	1130	1000	1120	1330	1520	1745	1000	0815	1531
		UNITS																							
NONE	Depth	feet	23	15	26	17	26	35	34	41	23	28	38	28	34	44	38	16	16	23	43	49	52	53	43
00400	pH	S.U.	6.9	7.0	6.9	6.9	7.1	7.1	7.1	6.9	7.0	7.1	7.4	7.2	7.2	7.2	7.2	7.1	7.4	7.5	8.0	7.3	7.2	7.1	7.2
00010	Temperature	°C	25.0	25.5	26.5	26.5	27.5	27.0	27.0	27.5	27.5	27.5	27.5	27.5	29.0	28.0	27.5	26.0	25.5	27.0	28.0	26.5	27.5	27.0	26.0
00299	DO	mg/ℓ	7.4	7.9	7.8	7.8	9.3	8.3	8.0	7.9	8.1	8.2	9.0	8.4	8.3	8.3	7.8	7.8	7.1	***	***	***	8.2	9.4	***
00090	ORP	mV	420	400	400	405	390	410	410	440	440	430	380	380	380	380	380	390	370	350	330	380	360	365	370
00094	Sp. Cond.	μmhos/cm	205	205	205	210	190	190	185	180	180	180	170	165	170	160	160	120	120	120	130	125	150	150	130
00077	Trans., S. D.	meters	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0.5	0.4	0.3	0.4	0.3	*	*	--
00034	L. Trans.	feet	8	8	4	4	7	7	9	8	9	9	8	8	9	8	8	3	3	3	3	3	6	5	--
00410	Alk., Total	mg/ℓ	28	28	28	28	28	27	26	26	26	26	25	25	26	26	27	40	42	42	44	42	30	34	43
00681	DOC	mg/ℓ	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
00680	TOC	mg/ℓ	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
32211	Chlorophyll, a	μg/ℓ	2	3	6	10	16	9	6	6	7	6	8	9	7	8	8	4	[illegible]	12	29	16	9	9	--
32212	Chlorophyll, b	μg/ℓ	1	1	1	1	2	2	2	2	1	1	1	1	1	1	1	2	2	2	5	3	2	2	--
32214	Chlorophyll, c	μg/ℓ	2	2	2	2	4	3	2	6	2	2	1	2	3	3	3	4	3	4	5	3	4	5	--
00080	Color, True	Pt. Co.	15	12	19	20	14	10	10	11	13	10	10	11	13	10	16	15	25	23	19	17	22	21	18
31616	Fecal Coliform	/100 mℓ	690	530	144	75	27	11	4	7	10	8	1	5	2	1	1	<10	10	<10	<10	10	6	<10	--
31673	Fecal Strep.	/100 mℓ	500	24	53	52	16	180	54	205	5	36	69	12	67	15	99	155	150	30	30	60	8	50	--
NONE	F.C./F.S. Ratio		1	22	3	1	2	<1	<1	<1	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	--
70300	Res., Tot. Filt.	mg/ℓ	138	148	146	136	123	138	112	109	108	120	108	118	117	115	110	91	94	102	107	110	116	121	110
00530	Res., Tot. Nonf.	mg/ℓ	12	11	32	28	22	21	12	13	10	14	9	14	11	12	11	17	33	28	22	25	16	14	17
00076	Turbidity	Hach FTU	9	6	18	22	13	12	8	8	7	8	[illegible]	8	8	8	8	20	27	25	25		15	15	26
00900	Hardness (Calc.)	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

NOTES: Dash (--) indicates analysis not required.

* Secchi disc lost 6/18/79.
** 208 is a bottom sample.
*** Abberant D. O. measurements due to damaged probe membrane.

TABLE A-8 . Physical-Chemical measurements, Main River Stations, Middle Black Warrior-Tombigbee Rivers, July 29 - August 1, 1979.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9
		DATE	7/29	7/29	7/29	7/29	7/29	8/1	8/1	8/1	8/1
		TIME	1000	1030	1220	1345	1605	1500	0915	1000	1055
		UNITS									
NONE	Depth	feet	25	25	25	17	18	38	Miss	48	28
00400	pH	S.U.	7.0	6.9	6.9	6.9	6.9	6.8	6.7	6.7	6.7
00010	Temperature	°C	27.5	27.0	27.5	28.0	28.0	29.0	29.0	28.5	28.5
00299	DO	mg/ℓ	7.6	7.7	8.0	8.1	8.3	8.0	7.4	7.0	9.1
00090	ORP	mV	440	440	460	460	460	480	480	460	480
00094	Sp. Cond.	µmhos/cm	190	190	180	180	170	160	150	140	140
00077	Trans., S. D.	meters	2.2	1.8	0.7	0.7	0.5	0.7	0.8	Miss	1.8
00034	L. Trans.	feet	8	7	6	7	5	6	6	Miss	8
00410	Alk., Total	mg/ℓ	29	28	27	27	25	26	24	23	24
00681	DOC	mg/ℓ	4.4	4.6	4.4	3.4	3.7	4.1	6.5	3.6	4.8
00680	TOC	mg/ℓ	4.6	5.1	5.4	4.9	4.8	4.2	6.0	5.3	5.8
32211	Chlorophyll, a	µg/ℓ	4	4	8	8	13	16	9	9	8
32212	Chlorophyll, b	µg/ℓ	1	1	1	2	2	2	2	1	1
32214	Chlorophyll, c	µg/ℓ	1	1	1	2	1	1	2	1	2
00080	Color, True	Pt. Co.	5	10	13	10	15	15	20	23	14
31616	Fecal Coliform	/100 mℓ	1390	1470	273	188	71	14	19	15	11
31673	Fecal Strep.	/100 mℓ	420	600	28	62	370	310	320	780	290
NONE	F.C./F.S. Ratio		3	2	10	3	<1	<1	<1	<1	<1
70300	Res., Tot. Filt.	mg/ℓ	132	138	125	120	114	134	104	92	95
00530	Res., Tot. Nonf.	mg/ℓ	8	14	12	16	21	12	16	13	10
00076	Turbidity	Hach FTU	7	9	9	11	13	9	11	11	8
00900	Hardness (Calc.)	mg/ℓ	--	--	--	--	--	--	--	--	--

STORET CODE	PARAMETER	STATION	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	8/1	7/31	7/31	7/31	7/31	7/31	7/30	7/30	7/30	7/30	7/30	7/31	7/31
		TIME	1255	1630	1455	1345	1235	1115	1010	1120	1316	1520	1650	1045	0900
		UNITS													
NONE	Depth	feet	31	Miss	23	34	49	34	13	16	31	43	46	52	46
00400	pH	S.U.	6.8	7.0	7.0	7.1	7.0	7.0	7.1	7.1	7.1	7.1	7.2	7.0	7.0
00010	Temperature	°C	29.0	29.0	29.0	29.0	29.5	29.5	27.5	27.5	26.2	28.5	29.0	28.5	28.5
00299	DO	mg/ℓ	8.0	8.4	8.1	8.2	8.1	7.6	8.0	7.6	7.7	7.3	8.2	7.5	7.0
00090	ORP	mV	470	460	470	470	470	470	460	420	460	440	460	450	470
00094	Sp. Cond.	µmhos/cm	150	150	150	150	160	160	110	120	120	140	150	160	150
00077	Trans., S. D.	meters	1.8	0.8	0.8	0.7	0.7	0.8	0.3	0.2	0.2	0.3	0.3	0.7	0.5
00034	L. Trans.	feet	8	7	7	6	6	7	3	2	3	3	3	6	5
00410	Alk., Total	mg/ℓ	25	21	26	26	23	26	38	42	43	48	50	30	38
00681	DOC	mg/ℓ	6.8	4.6	4.7	4.6	4.8	5.0	8.2	7.4	9.0	6.0	5.8	6.4	6.2
00680	TOC	mg/ℓ	7.5	4.3	4.9	7.0	5.5	5.3	7.6	7.7	7.3	6.6	10.1	6.6	6.0
32211	Chlorophyll, a	µg/ℓ	8	11	9	13	9	8	6	5	8	21	25	10	9
32212	Chlorophyll, b	µg/ℓ	1	2	1	2	2	2	1	1	2	4	6	1	1
32214	Chlorophyll, c	µg/ℓ	1	2	2	2	2	1	1	2	2	3	3	2	2
00080	Color, True	Pt. Co.	16	20	20	14	14	15	38	39	38	40	43	18	29
31616	Fecal Coliform	/100 mℓ	3	5	11	<1	12	5	14	66	25	1	1	3	3
31673	Fecal Strep.	/100 mℓ	1500	470	3950	190	370	420	590	850	180	570	490	260	790
NONE	F.C./F.S. Ratio		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
70300	Res., Tot. Filt.	mg/ℓ	108	112	118	120	119	126	85	86	104	104	110	125	129
00530	Res., Tot. Nonf.	mg/ℓ	10	14	16	12	13	13	26	47	30	35	29	14	19
00076	Turbidity	Hach FTU	8	11	10	8	8	8	25	35	41	32	32	11	16
00900	Hardness (Calc.)	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--

(--) Dash indicates analysis not required.

TABLE A-8 . Continued.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	7/29	7/29	7/29	7/29	7/29	8/1	8/1	8/1	8/1	8/1	7/31	7/31	7/31	7/31	7/31	7/30	7/30	7/30	7/30	7/30	7/31	7/31
		TIME	1000	1030	1220	1345	1605	1500	0915	1000	1055	1255	1630	1455	1345	1235	1115	1010	1120	1316	1520	1650	1045	0900
		UNITS																						
70986	ATP	mg/ℓ	24	16	14	36	24	<10	64	38	16	<10	40	20	112	26	180	<10	<10	<10	14	60	56	32
00916	Ca, Total	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
00940	Cl	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01046	Fe, Dissolved	μg/ℓ	60	60	60	60	60	110	110	210	160	90	110	90	110	110	110	460	460	485	510	360	60	60
74010	Fe, Total	mg/ℓ	0.36	0.46	0.58	0.56	0.77	0.71	0.97	0.97	[illegible]	0.89	0.87	0.81	0.56	0.71	0.71	2.80	3.00	2.74	2.69	2.24	0.97	1.17
00927	Mg, Total	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
01056	Mn, Dissolved	μg/ℓ	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
01055	Mn, Total	mg/ℓ	0.088	0.128	0.085	0.090	0.085	<0.05	<0.05	<0.05	<0.05	<0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.070	<0.05	<0.085	<0.05	<0.05	<0.05
00610	NH_3	mg/ℓ	0.22	0.21	0.26	0.13	0.19	0.18	0.28	0.18	0.20	0.28	0.14	0.18	0.14	0.17	0.20	0.20	0.22	0.21	0.22	0.12	0.15	0.17
00630	NO_2-NO_3	mg/ℓ	0.68	0.64	0.64	0.71	0.54	0.39	0.41	0.38	0.40	0.47	0.44	0.48	0.50	0.48	0.49	0.20	0.22	0.24	0.31	0.30	0.47	0.44
00625	TKN *	mg/ℓ	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
00640	TIN, (Calc.)	mg/ℓ	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
00605	TON, (Calc.)	mg/ℓ	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
00600	N, Total (Calc.)	mg/ℓ	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
00671	Diss. o-P	mg/ℓ	0.018	0.018	0.014	0.029	0.019	0.018	0.025	0.019	0.020	0.019	0.016	0.016	0.017	0.019	0.017	0.048	[illegible]	0.052	0.052	0.058	0.019	0.020
00665	P, Total	mg/ℓ	0.05	0.05	0.06	0.06	0.08	0.06	0.06	0.05	0.05	0.08	0.04	0.07	0.04	0.05	0.05	0.13	0.15	0.16	0.16	0.15	0.05	**
00937	K, Total	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
00929	Na, Total	mg/ℓ	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
00946	SO_4, Dissolved	mg/ℓ	44	47	51	47	40	34	34	28	36	28	34	37	38	34	39	10	10	10	10	11	34	26
00745	S, Total	mg/ℓ	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.2	0.4	0.3	0.2	0.3	<0.1	<0.1
01092	Zn	μg/ℓ	10	24	51	10	10	86	15	20	10	20	78	74	40	20	44	44	29	24	98	15	10	10
00405	CO_2 (calc)	mg/ℓ	5.1	5.3	5.4	5.2	5.1	5.4	5.7	5.6	5.7	5.4	3.7	4.7	3.6	4.0	4.7	5.1	5.3	5.3	5.3	5.1	5.1	5.3

Notes: * Data rejected due to instrument (Technicon AAII digester block) failure - results not reproducible
-- Dash indicates analysis not required.
+ Values not calculated due to loss of TKN data.
** Sample not analysed due to insuffucient volume.

TABLE A-9 . Physical-Chemical measurements, Main River Stations, Middle Black Warrior-Tombigbee Rivers, August 26 - 29, 1979.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	8/26	8/26	8/26	8/26	8/26	8/29	8/29	8/29	8/29	8/29	8/28	8/28	8/28	8/28	8/28	8/27	8/27	8/27	8/27	8/28	8/28	8/28
		TIME	1000	1120	1245	1315	1600	1040	1155	1340	1440	1615	1800	1630	1515	1415	1240	0920	1130	1330	1615	1105	0930	0810
		UNITS																						
NONE	Depth	feet	19	20	19	14	14	28	27	miss	25	26	35	35	35	45	39	13	20	25	45	40	48	46
00400	pH	S.U.	7.1	7.2	7.3	7.3	7.4	7.4	7.6	7.5	7.3	7.4	7.5	7.5	7.7	7.6	7.5	7.5	7.5	7.6	7.9	7.6	7.5	7.5
00010	Temperature	°C	28.0	28.0	28.5	28.5	29.0	29.0	29.5	29.5	29.5	29.5	29.5	29.5	34.0	31.0	30.0	28.0	28.0	28.0	29.5	29.0	29.0	29.0
00299	DO	mg/ℓ	7.4	7.1	7.3	7.3	7.7	8.6	8.8	8.7	7.8	8.2	8.6	7.9	7.7	8.3	7.9	7.6	7.2	6.4	6.7	5.7	5.5	5.8
00090	ORP	mV	440	460	450	460	440	560	530	550	510	520	490	490	480	490	490	450	440	430	410	440	460	460
00094	Sp. Cond.	μmhos/cm	210	210	200	210	200	190	190	190	180	180	170	160	160	150	140	140	140	140	150	140	140	140
00077	Trans., S. D.	meters	1.2	1.0	1.2	1.1	0.8	0.8	1.0	0.9	1.0	0.8	1.0	0.9	0.7	0.9	1.0	0.6	0.4	0.3	0.7	0.6	1.0	0.8
00034	L. Trans.	feet	8	8	14	9	6	7	8	8	8	6	8	8	8	8	9	4	3	3	4	5	6	6
00410	Alk., Total	mg/ℓ	26	26	26	24	27	28	30	29	27	27	27	25	26	26	25	46	47	48	50	51	39	42
00681	DOC	mg/ℓ	5.2	<2	4.1	4.8	<2	4.9	4.6	4.3	4.8	4.3	5.7	5.5	4.2	5.1	5.1	5.8	4.5	5.8	<2	7.1	6.9	7.6
00680	TOC	mg/ℓ	4.6	<2	2.0	4.0	<2	5.8	5.9	4.5	5.4	4.3	7.3	5.8	7.2	6.7	6.4	3.4	3.8	8.6	2.3	8.5	8.2	7.7
32211	Chlorophyll, a	μg/ℓ	2	2	2	5	10	15	10	9	6	8	13	5	6	9	6	8	7	6	41	15	12	8
32212	Chlorophyll, b	μg/ℓ	1	1	1	1	4	3	2	2	1	2	3	8	1	3	2	1	2	2	3	2	2	2
32214	Chlorophyll, c	μg/ℓ	2	<1	<1	1	1	4	3	3	<1	1	3	<1	2	4	1	1	3	1	3	5	3	<1
00080	Color, True	Pt. Co.	10	10	10	10	10	10	9	8	8	9	10	10	11	11	10	20	25	30	32	20	12	13
31616	Fecal Coliform	/100 mℓ	930	410	115	70	6	17	17	18	28	25	58	63	45	90	30	38	12	88	6	44	66	36
31673	Fecal Strep.	/100 mℓ	160	73	330	4	760	330	210	82	9	104	69	180	53	1410	135	195	770	280	24	210	505	122
NONE	F.C./F.S. Ratio		6	6	<1	18	<1	<1	<1	<1	3	<1	1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
70300	Res., Tot. Filt.	mg/ℓ	126	128	123	126	119	102	108	106	94	105	116	106	93	91	81	82	78	84	84	94	95	102
00530	Res., Tot. Nonf.	mg/ℓ	2	6	3	4	14	12	14	12	10	14	6	4	11	6	6	22	43	44	24	16	9	12
00076	Turbidity	Hach FTU	5	6	6	6	11	8	7	7	6	8	5	6	8	8	7	21	25	30	32	20	10	13
00900	Hardness (Calc.)	mg/ℓ	78	76	73	75	67	69	71	65	64	65	65	59	62	60	54	63	64	68	[illegible]	63	63	64

TABLE A-9 . Continued.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	8/26	8/26	8/26	8/26	8/26	8/29	8/29	8/29	8/29	8/29	8/28	8/28	8/28	8/28	8/28	8/27	8/27	8/27	8/27	8/28	8/28	8/28
		TIME																						
		UNITS																						
70996	ATP	mg/ℓ	<10	28	Miss	<10	<10	<10	<10	24	<10	<10	52	62	<10	10	<10	<10	<10	<10	12	154	240	<10
00916	Ca, Total	mg/ℓ	17.4	16.4	16.3	16.8	14.2	15.9	16.8	15.2	14.8	15.2	15.5	14.1	14.8	14.9	12.8	21.5	21.2	22.9	2[illegible].5	22.0	19.0	20.5
00940	Cl	mg/ℓ	4.0	4.0	4	6	4	7.0	8	8	7	9	9	7	7	7	7	10	9	8	9	9	7	9
01046	Fe, Dissolved	μg/ℓ	50	90	<50	<50	<50	<50	150	<50	70	<50	<50	<50	50	80	<50	<50	100	<50	80	<50	120	150
74010	Fe, Total	mg/ℓ	0.34	0.41	0.38	0.36	0.72	0.46	0.28	0.38	0.28	0.48	0.38	0.41	0.33	0.51	0.41	1.03	1.89	2.23	0.84	0.90	0.59	0.71
00927	Mg, Total	mg/ℓ	8.2	8.3	7.6	7.7	7.2	6.8	6.8	6.4	6.5	6.4	6.1	5.7	5.8	5.4	5.1	1.8	1.9	1.7	1.7	1.6	3.2	2.8
01056	Mn, Dissolved	μg/ℓ	260	100	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	80	50	<50	<50	<50	<50	<50
01055	Mn, Total	mg/ℓ	0.15	0.16	0.11	0.13	0.13	0.09	0.09	0.11	0.09	0.14	0.07	0.08	0.09	0.07	0.07	0.16	0.17	0.08	0.08	0.11	0.08	0.06
00610	NH_3	mg/ℓ	0.23	0.15	0.18	0.11	0.13	0.05	0.12	0.14	0.12	0.12	0.18	0.18	0.21	0.23	0.24	0.19	0.16	0.14	0.14	0.22	0.20	0.24
00630	NO_2-NO_3	mg/ℓ	0.73	0.68	0.63	0.68	0.57	0.46	0.44	0.43	0.40	0.39	0.38	0.41	0.41	0.41	0.38	0.12	0.11	0.18	0.04	0.06	0.19	0.17
00625	TKN	mg/ℓ	1.0	0.4	0.4	0.4	0.5	0.4	0.7	0.6	0.4	0.4	0.5	0.4	0.5	0.6	0.6	1.0	0.7	0.7	0.9	0.6	0.6	0.6
00640	TIN, (Calc.)	mg/ℓ	0.96	0.83	0.81	0.79	0.70	0.51	0.56	0.57	0.52	0.51	0.56	0.59	0.62	0.64	0.62	0.31	0.27	0.32	0.18	0.28	0.39	0.41
00605	TON, (Calc.)	mg/ℓ	0.77	0.25	0.22	0.29	0.37	0.35	0.58	0.08	0.08	0.08	0.32	0.22	0.29	0.37	0.36	0.81	0.54	0.56	0.76	0.38	0.40	0.36
00600	N, Total (Calc.)	mg/ℓ	1.73	1.08	1.03	1.08	1.07	0.86	1.14	0.65	0.60	0.59	0.88	0.81	0.91	1.01	0.98	1.12	0.81	0.88	0.94	0.66	0.79	0.77
00671	Diss. o-P	mg/ℓ	0.078	0.047	0.056	0.052	0.038	0.014	0.012	0.010	0.028	0.028	0.006	0.010	0.008	0.008	0.008	0.114	0.147	0.144	0.157	0.008	0.008	0.008
00665	P, Total	mg/ℓ	0.34	0.01	0.01	0.07	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.06	0.05	---	0.07	0.09	0.10	0.09	0.07	0.03	0.05
00937	K, Total	mg/ℓ	2.7	2.6	2.4	2.5	2.4	2.4	2.3	2.5	2.2	2.3	2.3	2.2	2.1	2.3	2.1	2.0	2.0	1.9	2.1	1.9	1.9	2.0
00929	Na, Total	mg/ℓ	9.8	9.5	9.3	10.4	10.2	9.4	10.2	10.1	9.4	9.6	11.0	9.1	[illegible]	[illegible]	[illegible]	[illegible].6	5.2	5.7	5.1	4.7	6.3	7.1
00946	SO_4, Dissolved	mg/ℓ	53	52	52	53	48	46	48	48	47	43	45	42	4[illegible]	[illegible]	[illegible]	10	2	3	1	2	20	14
00745	S, Total	mg/ℓ	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	0.[illegible]	0.3	0.3	0.3	<0.1	<0.1	<0.1	<0.1	0.4	0.4	<0.1
01092	Zn	μg/ℓ	15	10	10	<10	<10	10	<10	<10	<10	<10	<10	10	<10	10	10	18	<10	<10	<10	<10	10	16
00405	CO_2 (calc)	mg/ℓ	3.7	3.0	2.3	3.0	1.9	1.9	1.4	1.6	2.4	1.9	1.5	1.4	.90	1.2	1.4	2.6	5.0	2.1	1.1	2.2	2.2	2.4

TABLE A-9A. Physical-Chemical measurements, Rattlesnake Bend, Black Warrior-Tombigbee Rivers, August 26-29, 1979.

STORET CODE	PARAMETER	STATION	B8-T	B8-B			
		DATE	8/27	8/27			
		TIME	1800	1815			
		UNITS					
NONE	Depth	feet	35	32			
00400	pH	S.U.	9.1	7.3			
00010	Temperature	°C	30.0	28.0			
00299	DO	mg/ℓ	11.0	3.3			
00090	ORP	mV	310	380			
00094	Sp. Cond.	μmhos/cm	140	150			
00077	Trans., S. D.	inches	0.8	---			
00034	L. Trans.	feet	6	---			
00410	Alk., Total	mg/ℓ	52	72			
00681	DOC	mg/ℓ	3.9	*			
00680	TOC	mg/ℓ	≤2	*			
32211	Chlorophyll, a	μg/ℓ	21	---			
32212	Chlorophyll, b	μg/ℓ	3	---			
32214	Chlorophyll, c	μg/ℓ	<1	---			
00080	Color, True	Pt. Co.	15	35			
31616	Fecal Coliform	/100 mℓ	<1	---			
31673	Fecal Strep.	/100 mℓ	1270	---			
NONE	F.C./F.S. Ratio		<1	---			
70300	Res., Tot. Filt.	mg/ℓ	85	93			
00530	Res., Tot. Nonf.	mg/ℓ	12	22			
00076	Turbidity	Hach FTU	15	35			
00900	Hardness (Calc.)	mg/ℓ	70	81			

Dash (---) indicates analysis not required.
T = TOP B = BOTTOM
Asterisk (*) indicates results not obtained due to equipment failure.

TABLE A-9A. Continued.

STORET CODE	PARAMETER	STATION	B8-T	B8-B			
		DATE	8/27	8/27			
		TIME					
		UNITS					
70996	ATP	ng/ℓ	<10	Miss			
00916	Ca, Total	mg/ℓ	24.8	27.7			
00940	Cl	mg/ℓ	7	6			
01046	Fe, Dissolved	μg/ℓ	<50	100			
74010	Fe, Total	mg/ℓ	0.54	1.00			
00927	Mg, Total	mg/ℓ	1.6	1.7			
01056	Mn, Dissolved	μg/ℓ	<50	890			
01055	Mn, Total	mg/ℓ	< 0.05	1.44			
00610	NH_3	mg/ℓ	0.13	0.44			
00630	NO_2-NO_3	mg/ℓ	<0.01	0.02			
00625	TKN	mg/ℓ	0.6	0.7			
00640	TIN, (Calc.)	mg/ℓ	0.13	0.46			
00605	TON, (Calc.)	mg/ℓ	0.47	0.26			
00600	N, Total (Calc.)	mg/ℓ	0.60	0.72			
00671	Diss. o-P	mg/ℓ	0.144	0.196			
00665	P, Total	mg/ℓ	0.05	0.07			
00937	K, Total	mg/ℓ	1.9	1.8			
00929	Na, Total	mg/ℓ	5.2	4.1			
00946	SO_4, Dissolved	mg/ℓ	1	1			
00745	S, Total	mg/ℓ	<0.1	<0.1			
01092	Zn	μg/ℓ	<10	<10			
00405	CO_2 (calc)	mg/ℓ	<.1	5.3			

TABLE A-10. Physical-Chemical measurements, Main River Stations, **Middle Black Warrior-Tombigbee Rivers**, October 1 - 3, 1979.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	10/1	10/1	10/1	10/1	10/1	10/1	10/1	10/1	10/1	10/2	10/2	10/2	10/2	10/2	10/2	10/3	10/3	10/3	10/3	10/3	10/2	10/2
		TIME	0845	0945	1050	1130	1320	1515	1610	1715	1800	0935	1120	1240	1335	1415	1520	1610	1530	1330	1115	1000	1610	1715
		UNITS																						
NONE	Depth	feet	25	20	20	22	30	28	35	44	23	30	35	30	35	44	46	17	17	23	40	45	56	55
00400	pH	S.U.	6.9	7.3	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.3	7.2	7.2	7.2	7.2	7.3	7.0	7.1	7.1	7.1	7.1	7.2	7.2
00010	Temperature	°C	23.5	23.5	23.5	23.5	23.5	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	22.0	22.5	22.0	22.5	22.0	24.0	23.5
00299	DO	mg/ℓ	8.8	8.6	8.4	8.3	8.3	8.2	8.2	8.0	7.8	8.8	8.1	7.9	8.0	8.1	7.8	9.5	9.1	8.3	5.9	5.4	7.4	7.4
00090	ORP	mV	480	440	440	450	450	470	460	450	450	460	460	470	460	460	460	480	480	480	460	480	460	470
00094	Sp. Cond.	μmhos/cm	200	200	200	210	210	210	215	215	215	215	215	210	200	190	180	85	90	90	110	100	160	160
00077	Trans., S. D.	meters	1.1	1.3	1.2	1.1	1.1	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.3	0.3	0.5	0.5	0.5	0.8	0.7
00034	L. Trans.	feet	9	9	8	8	7	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
00410	Alk., Total	mg/ℓ	31	31	30	29	28	27	28	28	28	26	28	27	27	26	25	27	33	36	44	40	27	29
00681	DOC	mg/ℓ	<2	<2	<2	<2	<2	<2	<2	<2	<2	4.3	2.9	3.5	3.1	3.0	2.5	6.3	5.3	4.3	4.8	6.7	2.8	4.8
00680	TOC	mg/ℓ	<2	<2	<2	<2	<2	<2	4.6	2.7	<2	4.0	4.8	2.8	3.1	3.3	3.3	7.2	6.5	5.3	5.8	7.4	3.8	5.6
32211	Chlorophyll, a	μg/ℓ	2	4	2	1	Lost	3	2	4	4	2	2	3	3	4	3	5	2	4	6	4	5	6
32212	Chlorophyll, b	μg/ℓ	1	1	1	<1	Lost	1	1	1	2	1	<1	<1	1	1	1	1	2	1	<1	1	<1	1
32214	Chlorophyll, c	μg/ℓ	<1	<1	1	<1	Lost	<1	1	2	<1	<1	<1	<1	2	<1	1	<1	<1	<1	<1	<1	<1	<1
00080	Color, True	Pt. Co.	7	8	9	9	5	6	6	10	10	7	10	10	9	9	9	80	72	90	85	95	9	9
31616	Fecal Coliform	/100 mℓ	340	1860	550	420	450	164	135	150	210	132	127	90	55	53	17	12	26	8	4	6	2650	790
31673	Fecal Strep.	/100 mℓ	150	300	120	100	290	170	100	250	200	88	57	28	12	13	24	250	106	34	136	23	500	230
NONE	F.C./F.S. Ratio		2	6	5	4	2	1	1	<1	1	2	2	3	5	4	<1	<1	<1	<1	<1	<1	5	3
70300	Res., Tot. Filt.	mg/ℓ	149	139	136	142	135	115	128	132	139	149	128	121	118	115	107	81	76	89	97	92	96	99
00530	Res., Tot. Nonf.	mg/ℓ	6	5	7	7	15	12	20	11	20	8	13	12	11	10	4	29	30	18	10	11	8	12
00076	Turbidity	Hach FTU	5	6	6	6	8	14	15	14	16	13	17	14	13	12	10	29	27	22	16	18	12	13
00900	Hardness (Calc)	mg/ℓ	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Dash (---) indicates analysis not required.
Asterisk (*) indicates Light Transmissometer not functioning.

TABLE A-10. Continued.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	10/1	10/1	10/1	10/1	10/1	10/1	10/1	10/1	10/1	10/2	10/2	10/2	10/2	10/2	10/2	10/3	10/3	10/3	10/3	10/3	10/2	10/2
		TIME	0845	0945	1050	1130	1320	1515	1610	1715	1800	0935	1120	1240	1335	1415	1520	1610	1530	1330	1115	1000	1610	1715
		UNITS																						
70996	ATP	ng/ℓ	<10	64	16	16	36	48	20	16	300	24	44	38	18	56	86	18	34	38	88	54	90	70
00916	Ca, Total	mg/ℓ	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
00940	Cl	mg/ℓ	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
01046	Fe, Dissolved	µg/ℓ	<50	60	<50	<50	60	60	60	80	<50	<50	130	<50	<50	<50	80	430	430	410	350	390	60	130
74010	Fe, Total	mg/ℓ	0.35	0.38	0.44	0.47	0.75	1.11	1.08	1.08	1.04	0.98	1.22	0.92	0.87	1.35	0.69	2.51	2.50	2.18	1.52	1.71	0.54	0.92
00927	Mg, Total	mg/ℓ	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
01056	Mn, Dissolved	µg/ℓ	82	67	74	69	67	57	61	69	71	51	62	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
01055	Mn, Total	mg/ℓ	0.17	0.17	0.18	0.17	0.19	0.17	0.16	0.16	0.15	0.14	0.17	0.14	0.10	0.10	0.08	0.12	0.12	0.08	<0.05	0.06	0.08	0.08
00610	NH_3	mg/ℓ	0.05	0.06	0.04	0.04	0.05	0.06	0.06	0.06	0.12	0.09	0.13	0.09	0.10	0.09	0.14	0.12	0.08	0.13	0.12	0.09	0.08	0.07
00630	NO_2-NO_3	mg/ℓ	0.78	0.76	0.72	0.73	0.68	0.65	0.66	0.66	0.66	0.72	0.62	0.59	0.56	0.52	0.44	0.10	0.11	0.11	0.14	0.08	0.55	0.34
00625	TKN	mg/ℓ	0.4	0.4	1.1	0.7	0.7	1.0	0.8	0.4	0.7	0.8	1.0	0.8	0.7	0.9	1.0	1.0	1.1	1.4	0.9	0.9	0.5	0.7
00640	TIN, (Calc.)	mg/ℓ	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.7	0.6	0.6	0.2	0.2	0.2	0.3	0.2	0.6	0.4
00605	TON, (Calc.)	mg/ℓ	0.35	0.34	1.06	0.66	0.65	0.94	0.74	0.34	0.58	0.71	0.87	0.71	0.60	0.81	0.86	0.88	1.02	1.27	0.78	0.81	0.52	0.63
00600	N, Total (Calc.)	mg/ℓ	1.2	1.1	1.9	1.5	1.4	1.6	1.4	1.0	1.4	1.5	1.7	1.4	1.3	1.4	1.5	1.1	1.2	1.5	1.1	1.0	1.1	1.0
00671	Diss. o-P	mg/ℓ	0.013	0.014	0.008	0.020	0.013	0.006	0.018	0.007	0.006	0.006	0.005	0.005	0.006	0.005	0.007	0.023	0.033	0.031	0.031	0.042	0.018	0.028
00665	P, Total	mg/ℓ	0.02	0.02	0.02	0.03	0.03	0.07	0.04	0.04	0.04	0.04	0.04	0.05	0.04	0.04	0.03	0.11	0.10	0.10	0.10	0.10	0.04	0.07
00937	K, Total	mg/ℓ	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
00929	Na, Total	mg/ℓ	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
00946	SO_4, Dissolved	mg/ℓ	52	50	55	55	55	60	65	60	60	60	60	55	50	50	40	8	8	8	7	8	44	36
00745	S, Total	mg/ℓ	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	<0.1	1
01092	Zn	µg/ℓ	48	62	28	32	18	15	14	16	<10	11	15	14	10	20	18	<10	38	32	14	<10	<10	
00405	CO_2 (calc)	mg/ℓ	5.4	2.9	2.2	2.1	2.1	2.0	2.1	2.2	2.1	2.4	3.5	3.2	3.4	3.0	2.3	5.0	5.0	5.0	5.3	5.2	3.2	3.4

Dash (- -) indicates analysis not required.

APPENDIX B

QUALITY CONTROL RESULTS

TABLE B-1 . Results of duplicate analyses, Middle Black Warrior and Tombigbee Rivers, July 30 - August 4, 1978.

STORET CODE	PARAMETER	STATION	1	1 D		5	5 D		9	9 D		12	12 D		19	19 D		23	23 D
		DATE	7-30	7-30		7-31	7-31		8-1	8-1		8-2	8-2		8-4	8-4		8-3	8-3
		TIME	1000	1000		1010	1010		1520	1520		0935	0935		0935	0935		0845	0845
		UNITS																	
NONE	Depth	feet	-	-		-	-		-	-		-	-		-	-		-	-
00400	pH	S.U.	-	-		-	-		-	-		-	-		-	-		-	-
00010	Temperature	°C	-	-		-	-		-	-		-	-		-	-		-	-
00299	DO	mg/ℓ	-	-		-	-		-	-		-	-		-	-		-	-
00090	ORP	mV	-	-		-	-		-	-		-	-		-	-		-	-
00094	Sp. Cond.	μmhos/cm	-	-		-	-		-	-		-	-		-	-		-	-
00077	Trans., S. D.	inches	-	-		-	-		-	-		-	-		-	-		-	-
00034	L. Trans.	feet	-	-		-	-		-	-		-	-		-			-	-
00410	Alk., Total	mg/ℓ	25	25		25	25		22	39		25	25		35	40		40	35
00681	DOC	mg/ℓ	6.6	7.3		7.2	7.8		4.0	4.5		2.3	4.0		*	*		4.5	5.0
00680	TOC	mg/ℓ	2.9	3.1		2.2	2.9		3.2	4.2		2.0	2.0		*	*		5.7	5.5
32211	Chlorophyll, a	μg/ℓ	2	2		22	32		*	*		31	30		19	16		17	19
32212	Chlorophyll, b	μg/ℓ	1	<1		4	4		*	*		4	2		2	2		3	2
32214	Chlorophyll, c	μg/ℓ	1	<1		2	4		*	*		10	7		1	3		9	3
00080	Color, True	Pt. Co.	10	10		15	15		*	*		8	10		13	13		7	8
31616	Fecal Coliform	/100 mℓ	328	252		3	<1		*	*		<1	<1		<1	<1		<1	<1
31673	Fecal Strep.	/100 mℓ	16	22		24	14		*	*		21	18		300	300		<1	<1
NONE	F.C./F.S. Ratio		20	11		<1	<1		*	*		<1	<1		<1	<1		<1	<1
70300	Res., Tot. Filt.	mg/ℓ	135	134		110	120		155	151		119	97		*	*		124	120
00530	Res., Tot. Nonf.	mg/ℓ	6	7		21	15		11	9		16	17		*	*		10	8
00076	Turbidity	Hach FTU	4	5		12	9		4	4		4	4		4	4		4	5
[illegible]	Hardness (Calc.)	mg/ℓ	-	-		-	-		-	-		-	-		-	-		-	-

Dash (-) indicates duplicate analysis not required.
Asterisk (*) indicates duplicate analysis not performed.

TABLE B-1 . Continued.

STORET CODE	PARAMETER	STATION	1	1 D		5	5 D		9	9 D		12	12 D		19	19 D		23	23 D
		DATE	7-30	7-30		7-31	7-31		8-1	8-1		8-2	8-2		8-4	8-4		8-3	8-3
		TIME	1000	1000		1010	1010		1520	1520		0935	0935		0935	0935		0845	0845
		UNITS																	
70996	ATP	mg/ℓ	-	-		-	-		-	-		-	-		-	-		-	-
00916	Ca, Total	mg/ℓ	-	-		-	-		-	-		-	-		-	-		-	-
00940	Cl	mg/ℓ	-	-		-	-		-	-		-	-		-	-		-	-
01046	Fe, Dissolved	μg/ℓ	176	127		180	175		56	68		69	125		73	60		79	63
74010	Fe, Total	mg/ℓ	0.25	0.31		0.58	0.39		0.31	0.28		0.37	0.45		0.34	0.31		0.31	0.75
00927	Mg, Total	mg/ℓ	-	-		-	-		-	-		-	-		-	-		-	-
01056	Mn, Dissolved	μg/ℓ	35	26		<4	<4		<2	<2		<2	<2		<2	<4		<4	<4
01055	Mn, Total	mg/ℓ	0.07	0.08		0.07	0.09		0.04	0.05		0.06	0.07		0.03	0.03		0.04	0.04
00610	NH_3	mg/ℓ	0.03	0.09		0.05	0.06		0.03	0.03		<0.03	<0.03		<0.03	<0.03		0.03	<0.03
00630	NO_2-NO_3	mg/ℓ	0.53	0.51		0.53	0.55		0.27	0.24		0.36	0.40		<0.01	<0.01		0.27	0.23
00625	TKN	mg/ℓ	0.3	0.2		0.3	0.3		1.2	1.0		1.0	0.8		0.4	0.7		0.2	0.2
00640	TIN, (Calc.)	mg/ℓ	0.1	0.6		0.6	0.6		0.3	0.3		0.4	0.4		<0.04	<0.04		0.3	0.2
00605	TON, (Calc,)	mg/ℓ	0.3	0.1		0.2	0.2		1.2	1.0		1.0	0.8		0.4	0.7		0.2	0.2
00600	N, Total (Calc.)	mg/ℓ	0.4	0.7		0.8	0.8		1.5	1.3		1.4	1.2		0.4	0.7		0.5	0.4
00671	Diss. o-P	mg/ℓ	0.014	0.009		0.018	<0.001		0.013	0.005		<0.001	<0.001		0.004	0.005		<0.001	<0.001
00665	P, Total	mg/ℓ	0.02	0.02		0.03	0.04		0.04	0.08		0.04	0.06		0.05	0.04		0.03	0.04
00937	K, Total	mg/ℓ	-	-		-	-		-	-		-	-		-	-		-	-
00929	Na, Total	mg/ℓ	-	-		-	-		-	-		-	-		-	-		-	-
00946	SO_4, Dissolved	mg/ℓ	49	50		50	49		41	40		42	43		10	10		30	30
00745	S, Total	mg/ℓ	0.01	0.01		0.01	0.01		<0.01	<0.01		<0.01	<0.01		<0.02	<0.02		<0.01	<0.01
01092	Zn	μg/ℓ	160	130		200	640		110	190		460	760		170	2201		240	520

Dash (-) indicates duplicate analysis not required.
Asterisk (*) indicates duplicate analysis not performed

TABLE B-2. Results of duplicate spiked analyses, Middle Black Warrior and Tombigbee Rivers, July 30 - August 4, 1978.

STORET CODE	PARAMETER	STATION	3 D	9 D	12 D	20 D	23 D
		DATE	7/30	8/1	8/2	8/4	8/3
		TIME					
		UNITS					
70996	ATP	mg/ℓ	-	-	-	-	-
00681	DOC	mg/ℓ	*	*	*	*	*
00680	TOC	mg/ℓ	*	*	*	*	*
01046	Fe, Dissolved	µg/ℓ	-	-	-	-	-
74010	Fe, Total	mg/ℓ	*	98%	115%	*	101%
00927	Mg, Total	mg/ℓ	-	-	-	-	-
01056	Mn, Dissolved	µg/ℓ	-	-	-	-	-
01055	Mn, Total	mg/ℓ	*	110%	114%	*	147%
00610	NH_3	mg/ℓ	*	100%	*	109%	100%
00630	NO_2-NO_3	mg/ℓ	*	99%	*	103%	107%
00625	TKN	mg/ℓ	*	*	111%	*	104%
00640	TIN, (Calc.)	mg/ℓ	-	-	-	-	-
00605	TON, (Calc.)	mg/ℓ	-	-	-	-	-
00600	N, Total (Calc.)	mg/ℓ	-	-	-	-	-
00671	Diss. o-P	mg/ℓ	81%	*	*	*	*
00665	P, Total	mg/ℓ	87%	*	*	*	*
00937	K, Total	mg/ℓ	-	-	-	-	-
00929	Na, Total	mg/ℓ	-	-	-	-	-
00946	SO_4, Dissolved	mg/ℓ	*	*	*	*	*
00745	S, Total	mg/ℓ	-	-	-	-	-
01092	Zn	µg/ℓ	-	-	-	-	-

Dash (-) indicates duplicate spiked analysis not required.
Asterisk (*) indicates duplicate spiked analysis not performed.

TABLE B-3 . Results of duplicate analyses, Middle Black Warrior and Tombigbee Rivers, August 27 - 31, 1978.

STORET CODE	PARAMETER	STATION	17	17 D		1	1 D		6	5 D		8	8 D		13	13 D
		DATE	8/27	8/27		8/28	8/28		8/29	8/29		8/30	8/30		8/31	8/31
		TIME	1000	1000		1015	1015		0955	0955		1130	1130		1020	1020
		UNITS														
NONE	Depth	feet	-	-		-	-		-	-		-	-		-	-
00400	pH	S.U.	-	-		-	-		-	-		-	-		-	-
00010	Temperature	°C	-	-		-	-		-	-		-	-		-	-
C0299	DO	mg/ℓ	-	-		-	-		-	-		-	-		-	-
00090	ORP	mV	-	-		-	-		-	-		-	-		-	-
00094	Sp. Cond.	μmhos/cm	-	-		-	-		-	-		-	-		-	-
00077	Trans., S. D.	inches	-	-		-	-		-	-		-	-		-	-
00034	L. Trans.	feet	-	-		-	-		-	-		-	-		-	-
00410	Alk., Total	mg/ℓ	41	40		27	27		28	28		29	29		26	25
00681	DOC	mg/ℓ	15.7	27.4		2.6	2.7		1.5	2.1		4.6	4.5		1.4	0.5
00680	TOC	mg/ℓ	6.8	5.5		3.0	5.2		3.5	2.7		4.0	3.9		4.8	2.9
32211	Chlorophyll, a	μg/ℓ	*	*		*	*		*	*		*	*		*	*
32212	Chlorophyll, b	μg/ℓ	*	*		*	*		*	*		*	*		*	*
32214	Chlorophyll, c	μg/ℓ	*	*		*	*		*	*		*	*		*	*
00080	Color, True	Pt. Co.	11	12		12	11		13	13		13	14		13	13
31616	Fecal Coliform	/100 mℓ	*	*		9	<5		<1	<1		<1	<1		<1	<1
31673	Fecal Strep.	/100 mℓ	*	*		14	14		147	116		60	51		<1	9
NONE	F.C./F.S. Ratio		*	*		<1	<1		<1	<1		<1	<1		<1	<1
70300	Res., Tot. Filt.	mg/ℓ	81	92		112	108		99	99		147	142		60	116
00530	Res., Tot. Nonf.	mg/ℓ	12	10		5	8		25	25		15	19		11	13
00076	Turbidity	Hach FTU	8	8		3	3		13	13		9	10		6	5
00900	Hardness (Calc.)	mg/ℓ	-	-		-	-		-	-						

Dash (-) indicates duplicate analysis not required.
Asterisk (*) indicates duplicate analysis not performed.

TABLE B-3 . Continued.

STORET CODE	PARAMETER	STATION	17	17 D		1	1 D		5	5 D			8	8 D		13	13 D
		DATE	8/27	8/27		8/28	8/28		8/29	8/29			8/30	8/30		8/31	8/31
		TIME	1000	1000		1015	1015		0955	0955			1130	1130		1020	1020
		UNITS															
70996	ATP	mg/ℓ	-	-		-	-		-	-			-	-		-	-
00916	Ca, Total	mg/ℓ	15.8	15.3		12.5	12.4		13.9	12.1			10.1	10.7		11.1	10.1
00940	Cl	mg/ℓ	14	13		6	8		5	5			*	*		8	9
01046	Fe, Dissolved	μg/ℓ	90	40		38	43		23	43			38	61		208	80
74010	Fe, Total	mg/ℓ	1.86	0.67		0.18	0.24		2.6	0.60			0.90	0.66		0.66	0.24
00927	Mg, Total	mg/ℓ	1.1	1.2		3.2	3.4		3.2	2.1			3.2	3.2		3.2	3.3
01056	Mn, Dissolved	μg/ℓ	<8	<8		<8	<8		<8	<8			17	12		<8	<8
01055	Mn, Total	mg/ℓ	0.02	0.03		0.04	0.03		0.04	0.04			0.23	0.19		0.10	0.10
00610	NH_3	mg/ℓ	0.02	0.01		0.08	0.06		0.06	0.06			0.14	0.10		0.06	0.05
00630	NO_2-NO_3	mg/ℓ	0.10	0.13		0.51	0.49		0.37	0.31			0.30	0.31		*	*
00625	TKN	mg/ℓ	0.7	0.6		0.1	0.1		0.2	0.2			0.2	0.2		0.2	0.1
00640	TIN, (Calc.)	mg/ℓ	0.12	0.14		0.59	0.55		0.43	0.37			0.44	0.41		*	*
00605	TON, (Calc.)	mg/ℓ	0.68	0.59		0.02	0.04		0.14	0.14			0.06	0.10		*	*
00600	N, Total (Calc.)	mg/ℓ	0.80	0.73		0.61	0.59		0.57	0.51			0.50	0.51		*	*
00671	Diss. o-P	mg/ℓ	0.014	0.009		0.007	0.002		0.025	0.027			0.006	0.003		0.001	0.012
00665	P, Total	mg/ℓ	0.07	0.10		0.05	0.04		0.10	0.11			0.22	0.22		0.08	0.12
00937	K, Total	mg/ℓ	1.36	1.30		1.87	1.75		1.77	1.84			1.57	1.47		1.60	1.61
00929	Na, Total	mg/ℓ	8.90	9.16		9.88	10.76		10.26	11.00			10.80	10.10		11.14	10.66
00946	SO_4, Dissolved	mg/ℓ	9	9		53	51		48	47			36	37		39	39
00745	S, Total	mg/ℓ	*	*		2.4	1.7		<0.1	1.8			0.8	<0.1		*	*
01092	Zn	μg/ℓ	<50	108		64	<50		240	540			108	<50		<50	<50

Dash (-) indicates duplicate analysis not required.
Asterisk (*) indicates duplicate analysis not performed.

TABLE B-4 . Results of duplicate spiked analyses
Middle Black Warrior and Tombigbee R. ers,
August 27 - 31, 1978.

STORET CODE	PARAMETER	STATION	1 D	5 D	6 D	8 D	13 D	17 D	20 D	21 D
		DATE	8/28	8/29	8/29	8/30	8/31	8/27	8/27	8/31
		TIME								
		UNITS								
70996	ATP	mg/ℓ	-	-	-	-	-	-	-	-
00681	DOC	mg/ℓ	89%	*	*	*	*	*	*	*
00680	TOC	mg/ℓ	93%	108%	*	*	86%	*	*	*
01046	Fe, Dissolved	µg/ℓ	-	-	-	-	-	-	-	-
74010	Fe, Total	mg/ℓ	106%	109%	*	101%	98%	73%	*	*
00927	Mg, Total	mg/ℓ	90%	87%	*	82%	91%	94%	*	*
01056	Mn, Dissolved	µg/ℓ	-	-	-	-	-	-	-	-
01055	Mn, Total	mg/ℓ	111%	79%	*	92%	128%	85%	*	*
00610	NH_3	mg/ℓ	*	*	*	*	*	*	*	*
00630	NO_2-NO_3	mg/ℓ	*	*	97%	*	*	*	94%	*
00625	TKN	mg/ℓ	*	*	*	*	*	*	*	*
00640	TIN, (Calc.)	mg/ℓ	-	-	-	-	-	-	-	-
00605	TON, (Calc.)	mg/ℓ	-	-	-	-	-	-	-	-
00600	N, Total (Calc.)	mg/ℓ	-	-	-	-	-	-	-	-
00671	Diss. o-P	mg/ℓ	105%	*	93%	82%	81%	88%	*	*
00665	P, Total	mg/ℓ	*	*	*	*	*	*	*	127%
00937	K, Total	mg/ℓ	92%	94%	*	108%	95%	100%	*	*
00929	Na, Total	mg/ℓ	99%	92%	*	83%	95%	91%	*	*
00946	SO_4, Dissolved	mg/ℓ	*	*	*	*	*	*	*	*
00745	S, Total	mg/ℓ	-	-	-	-	-	-	-	-
01092	Zn	µg/ℓ	-	-	-	-	-	-	-	-

Dash (-) indicates duplicate spiked analysis not required.
Asterisk (*) indicates duplicate spiked analysis not performed.

TABLE B-5 . Results of duplicate analyses, Middle Black Warrior and Tombigbee Rivers, October 1 - 5, 1978.

STORET CODE	PARAMETER	STATION	1	1 D		7	7 D		13	13 D		17	17 D		20	20 D
		DATE	10/2	10/2		10/3	10/3		10/4	10/4		10/1	10/1		10/5	10/5
		TIME	0850			0930			1010			1315			0845	
		UNITS														
NONE	Depth	feet	-	-		-	-		-	-		-	-		-	-
00400	pH	S.U.	-	-		-	-		-	-		-	-		-	-
00010	Temperature	°C	-	-		-	-		-	-		-	-		-	-
00299	DO	mg/ℓ	-	-		-	-		-	-		-	-		-	-
00090	ORP	mV	-	-		-	-		-	-		-	-		-	-
00094	Sp. Cond.	μmhos/cm	-	-		-	-		-	-		-	-		-	-
00077	Trans., S. D.	inches	-	-		-	-		-	-		-	-		-	-
00034	L. Trans.	feet	-	-		-	-		-	-		-	-		-	-
00410	Alk., Total	mg/ℓ	26	31		30	27		13	14		43	50		26	26
00681	DOC	mg/ℓ	11.4	10.8		10.3	7.6		12.7	9.1		10.5	9.3		14.1	9.0
00680	TOC	mg/ℓ	10.9	10.6		8.9	9.2		15.3	11.2		11.2	11.2		17.4	15.8
32211	Chlorophyll, a	μg/ℓ	2	2		*	*		8	8		*	*		10	11
32212	Chlorophyll, b	μg/ℓ	1	1		*	*		1	1		*	*		1	2
32214	Chlorophyll, c	μg/ℓ	5	2		*	*		2	3		*	*		1	2
00080	Color, True	Pt. Co.	10	10		12	12		13	14		15	15		14	14
31616	Fecal Coliform	/100 mℓ	2,750	3510		<1	<1		*	*		7	7		<1	<1
31673	Fecal Strep.	/100 mℓ	180	260		6	6		5	7		31	32		16	8
NONE	F.C./F.S. Ratio		15	13		<1	<1		*	*		<1	<1		<1	<1
70300	Res., Tot. Filt.	mg/ℓ	105	99		120	137		117	108		129	106		98	93
00530	Res., Tot. Nonf.	mg/ℓ	5	<1		1	4		<1	<1		4	2		10	8
00076	Turbidity	Hach FTU	3	3		3	3		2	2		3	4		6	6

Dash (-) indicates duplicate analysis not required.
Asterisk (*) indicates duplicate analysis not performed.

TABLE B-5 . Continued.

STORET CODE	PARAMETER	STATION	1	1 D		7	7 D		13	13 D		17	17 D		20	20 D
		DATE	10/2	10/2		10/3	10/3		10/4	10/4		10/1	10/1		10/5	10/5
		TIME	0850			0930			1010			1315			0845	
		UNITS														
70996	ATP	mg/ℓ	-	-		-	-		-	-		-	-		-	-
00916	Ca, Total	mg/ℓ	-	-		-	-		-	-		-	-		-	-
00940	Cl	mg/ℓ	4	4		7	8		8	8		12	12		12	12
01046	Fe, Dissolved	µg/ℓ	34	35		19	21		41	37		24	21		39	41
74010	Fe, Total	mg/ℓ	0.37	0.33		0.45	0.74		0.53	0.33		0.33	0.66		0.66	0.70
00927	Mg, Total	mg/ℓ	-	-		-	-		-	-		-	-		-	-
01056	Mn, Dissolved	µg/ℓ	36	35		7	7		7	7		10	8		10	8
01055	Mn, Total	mg/ℓ	0.1	0.2		<0.1	0.1		0.1	0.1		0.2	0.3		0.2	0.1
00610	NH_3	mg/ℓ	0.11	0.13		0.06	0.06		0.03	0.03		0.05	0.05		0.02	0.02
00630	NO_2-NO_3	mg/ℓ	0.33	0.35		0.20	0.26		0.26	0.31		0.07	0.05		0.08	0.09
00625	TKN	mg/ℓ	0.4	0.4		0.4	0.4		0.3	0.2		0.4	0.5		0.2	0.3
00640	TIN, (Calc.)	mg/ℓ	0.4	0.5		0.3	0.3		0.3	0.3		0.1	0.1		0.1	0.1
00605	TON, (Calc.)	mg/ℓ	0.3	0.3		0.3	0.3		0.3	0.2		0.4	0.4		0.2	0.3
00600	N, Total (Calc.)	mg/ℓ	0.7	0.8		0.6	0.6		0.6	0.5		0.5	0.5		0.3	0.4
00671	Diss. o-P	mg/ℓ	0.010	0.010		0.004	0.002		0.007	0.005		0.012	0.012		0.003	0.003
00665	P, Total	mg/ℓ	0.05	<0.01		0.03	0.01		0.04	0.06		*	*		0.03	0.02
00937	K, Total	mg/ℓ	-	-		-	-		-	-		-	-		-	-
00929	Na, Total	mg/ℓ	-	-		-	-		-	-		-	-		-	-
00946	SO_4, Dissolved	mg/ℓ	46	46		40	36		41	41		6	9		8	9
00745	S, Total	mg/ℓ	<0.1	<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1
01092	Zn	µg/ℓ	32	41		99	91		91	410		50	41		66	82

Dash (-) indicates duplicate analysis not required.
Asterisk (*) indicates duplicate analysis not performed.

TABLE B-6 . Results of duplicate spiked analyses, Middle Black Warrior and Tombigbee Rivers, October 1 - 5, 1978.

STORET CODE	PARAMETER	STATION	1 D	7 D	13 D	17 D	20 D		
		DATE	10/2	10/3	10/4	10/1	10/5		
		TIME							
		UNITS							
70996	ATP	mg/ℓ	-	-	-	-	-		
00681	DOC	mg/ℓ	*	*	*	*	*		
00680	TOC	mg/ℓ	*	*	*	*	*		
01046	Fe, Dissolved	μg/ℓ	-	-	-	-	-		
74010	Fe, Total	mg/ℓ	*	103 %	94 %	124 %	104 %		
00927	Mg, Total	mg/ℓ	-	-	-	-	-		
01056	Mn, Dissolved	μg/ℓ	-	-	-	-	-		
01055	Mn, Total	mg/ℓ	*	97 %	113 %	98 %	118 %		
00610	NH_3	mg/ℓ	*	100 %	99 %	103 %	104 %		
00630	NO_2-NO_3	mg/ℓ	*	116 %	107 %	98 %	89 %		
00625	TKN	mg/ℓ	*	118 %	92 %	97 %	94 %		
00640	TIN, (Calc.)	mg/ℓ	-	-	-	-	-		
00605	TON, (Calc.)	mg/ℓ	-	-	-	-	-		
00600	N, Total (Calc.)	mg/ℓ	-	-	-	-	-		
00671	Diss. o-P	mg/ℓ	*	*	103 %	*	*		
00665	P, Total	mg/ℓ	*	*	103 %	*	*		
00937	K, Total	mg/ℓ	-	-	-	-	-		
00929	Na, Total	mg/ℓ	-	-	-	-	-		
00946	SO_4, Dissolved	mg/ℓ	97 %	102 %	95 %	91 %	*		
00745	S, Total	mg/ℓ	-	-	-	-	-		
01092	Zn	μg/ℓ	-	-	-	-	-		

Dash (-) indicates duplicate spiked analysis not required.
Asterisk (*) indicates duplicate spiked analysis not performed.

TABLE B-7. Results of duplicate analyses, Middle Black Warrior and Tombigbee Rivers, December 10 - 14, 1978.

STORET CODE	PARAMETER	STATION	1	1D	4	4D	9	9D	17	17D	23	23D
		DATE	12/11	12/11	12/12	12/12	12/13	12/13	12/10	12/10	12/14	12/14
		TIME	1310		1020		0810		1045		1000	
		UNITS										
NONE	Depth	feet	-	-	-	-	-	-	-	-	-	-
00400	pH	S.U.	-	-	-	-	-	-	-	-	-	-
00010	Temperature	°C	-	-	-	-	-	-	-	-	-	-
00299	DO	mg/ℓ	-	-	-	-	-	-	-	-	-	-
00090	ORP	mV	-	-	-	-	-	-	-	-	-	-
00094	Sp. Cond.	µmhos/cm	-	-	-	-	-	-	-	-	-	-
00077	Trans., S. D.	inches	-	-	-	-	-	-	-	-	-	-
00034	L. Trans.	feet	-	-	-	-	-	-	-	-	-	-
00410	Alk., Total	mg/ℓ	24	26	26	26	22	22	21	21	*	*
00681	DOC	mg/ℓ	*	*	3.0	2.7	*	*	*	*	*	*
00680	TOC	mg/ℓ	*	*	4.7	3.6	*	*	*	*	*	*
32211	Chlorophyll, a	µg/ℓ	*	*	*	*	*	*	*	*	*	*
32212	Chlorophyll, b	µg/ℓ	*	*	*	*	*	*	*	*	*	*
32214	Chlorophyll, c	µg/ℓ	*	*	*	*	*	*	*	*	*	*
00080	Color, True	Pt. Co.	*	*	20	20	16	16	45	51	*	*
31616	Fecal Coliform	/100 mℓ	120	170	116	116	150	177	45	56	318	336
31673	Fecal Strep.	/100 mℓ	140	130	26	41	61	90	69	77	250	410
NONE	F.C./F.S. Ratio		1	1	4	3	2	2	1	1	1	1
70300	Res., Tot. Filt.	mg/ℓ	126	125	86	110	*	*	67	57	*	*
00530	Res., Tot. Nonf.	mg/ℓ	13	13	26	30	*	*	19	28	*	*
00076	Turbidity	Hach FTU	18	18	31	32	51	51	42	43	53	52
[illegible]	Hardness (Calc.)	mg/ℓ	-	-	-	-	-	-	-	-	-	-

Dash (-) indicates duplicate analysis not required.
Asterisk (*) indicates duplicate analysis not performed.

TABLE B-7 . Continued.

STORET CODE	PARAMETER	STATION	1	1D		4	4D		9	9D		17	17D		23	23D
		DATE	12/11	12/11		12/12	12/12		12/13	12/13		12/10	12/10		12/14	12/14
		TIME	1310			1020			0810			1045			1000	
		UNITS														
70996	ATP	mg/ℓ	-	-		-	-		-	-		-	-		-	-
00916	Ca, Total	mg/ℓ	-	-		-	-		-	-		-	-		-	-
00940	Cl	mg/ℓ	-	-		-	-		-	-		-	-		-	-
01046	Fe, Dissolved	μg/ℓ	41	66		59	62		127	157		400	370		148	120
74010	Fe, Total	mg/ℓ	0.56	0.94		0.45	0.79		1.06	0.71		2.46	3.15		1.74	1.55
00927	Mg, Total	mg/ℓ	-	-		-	-		-	-		-	-		-	-
01056	Mn, Dissolved	μg/ℓ	200	227		310	227		63	90		29	14		3	[illegible]
01055	Mn, Total	mg/ℓ	0.25	0.25		0.39	0.28		0.15	0.17		0.09	0.15		[illegible]	[illegible]
00610	NH_3	mg/ℓ	0.08	0.06		0.05	0.06		0.10	0.10		0.11	0.13		[illegible]	0.13
00630	NO_2-NO_3	mg/ℓ	0.44	0.46		0.46	0.45		0.42	0.44		0.22	0.23		0.34	0.32
00625	TKN	mg/ℓ	*	*		0.4	0.2		[illegible]	[illegible]		0.4	0.3		0.5	0.3
00640	TIN, (Calc.)	mg/ℓ	*	*		0.5	0.5		0.5	[illegible]		0.3	0.4		0.5	0.4
00605	TON, (Calc.)	mg/ℓ	*	*		0.35	0.14		0.10	[illegible]		0.29	0.17		0.36	0.17
00600	N, Total (Calc.)	mg/ℓ	*	*		0.8	0.6		0.6	0.7		0.6	0.6		0.9	0.6
00671	Diss. o-P	mg/ℓ	0.021	0.014		0.017	0.019		0.036	0.031		[illegible]	0.051		0.059	0.057
00665	P, Total	mg/ℓ	0.04	0.04		0.05	0.06		0.13	0.14		0.16	0.15		0.20	[illegible]
00937	K, Total	mg/ℓ	-	-		-	-		-	-		-	-		-	-
00929	Na, Total	mg/ℓ	-	-		-	-		-	-		-	-		-	-
00946	SO_4, Dissolved	mg/ℓ	*	*		*	*		*	*		*	*		*	*
00745	S, Total	mg/ℓ	0.1	0.1		0.2	0.2		0.1	<0.1		0.5	0.6		*	*
01092	Zn	μg/ℓ	33	52		62	43		24	81		100	71		71	24

Dash (-) indicates duplicate analysis not required.
Asterisk (*) indicates duplicate analysis not performed.

TABLE B-8 . Results of duplicate spiked analyses, Middle Black Warrior and Tombigbee Rivers, December 10 - 14, 1978.

STORET CODE	PARAMETER	STATION	1 D	4 D	9 D	17 D	19 D	23 D
		DATE	12/11	12/12	12/13	12/10	12/10	12/14
		TIME						
		UNITS						
70996	ATP	mg/ℓ	-	-	-	-	-	-
00681	DOC	mg/ℓ	*	*	*	*	*	*
00680	TOC	mg/ℓ	*	96%	*	90%	*	*
01046	Fe, Dissolved	μg/ℓ	-	-	-	-	-	-
74010	Fe, Total	mg/ℓ	129%	110%	128%	114%	*	115%
00927	Mg, Total	mg/ℓ	-	-	-	-	-	-
01056	Mn, Dissolved	μg/ℓ	-	-	-	-	-	-
01055	Mn, Total	mg/ℓ	128%	103%	123%	129%	*	*
00610	NH_3	mg/ℓ	100%	105%	105%	103%	100%	96%
00630	NO_2-NO_3	mg/ℓ	*	102%	102%	91%	*	90%
00625	TKN	mg/ℓ	134%	156%	103%	100%	*	*
00640	TIN, (Calc.)	mg/ℓ	-	-	-	-	-	-
00605	TON, (Calc.)	mg/ℓ	-	-	-	-	-	-
00600	N, Total (Calc.)	mg/ℓ	-	-	-	-	-	-
00671	Diss. o-P	mg/ℓ	117%	92%	85%	103%	*	96%
00665	P, Total	mg/ℓ	92%	88%	*	*	96%	99%
00937	K, Total	mg/ℓ	-	-	-	-	-	-
00929	Na, Total	mg/ℓ	-	-	-	-	-	-
00946	SO_4, Dissolved	mg/ℓ	*	*	*	*	*	*
00745	S, Total	mg/ℓ	-	-	-	-	-	-
01092	Zn	μg/ℓ	106%	101%	105%	93%	*	98%

Dash (-) indicates duplicate spiked analysis not required.
Asterisk (*) indicates duplicate spiked analysis not performed.

TABLE B-9 . Results of duplicate analyses, Middle Black Warrior and Tombigbee Rivers, February 27 - March 2, 1979.

STORET CODE	PARAMETER	STATION	1	1 Dup.		5	5 Dup.		10	10 Dup.		17	17 Dup.
		DATE	3/1	3/1		2/28	2/28		2/26	2/26		2/27	2/27
		TIME											
		UNITS											
NONE	Depth	feet	-	-		-	-		-	-		-	-
00400	pH	S.U.	-	-		-	-		-	-		-	-
00010	Temperature	°C	-	-		-	-		-	-		-	-
00299	DO	mg/ℓ	-	-		-	-		-	-		-	-
00090	ORP	mV	-	-		-	-		-	-		-	-
00094	Sp. Cond.	μmhos/cm	-	-		-	-		-	-		-	-
00077	Trans., S. D.	inches	-	-		-	-		-	-		-	-
00034	L. Trans.	feet	-	-		-	-		-	-		-	-
00410	Alk., Total	mg/ℓ	20	20		19	18		18	18		40	39
00681	DOC	mg/ℓ	4	5		3	3		3	6		7	6
00680	TOC	mg/ℓ	4	4		4	5		3	3		15	16
32211	Chlorophyll, a	μg/ℓ	1	1		1	1		4	2		miss	miss
32212	Chlorophyll, b	μg/ℓ	<1	<1		<1	<1		1	<1		miss	miss
32214	Chlorophyll, c	μg/ℓ	3	2		1	2		3	2		miss	miss
00080	Color, True	Pt. Co.	18	17		23	23		23	25		55	58
31616	Fecal Coliform	/100 mℓ	32	41		73	115		60	184		1800	miss
31673	Fecal Strep.	/100 mℓ	52	111		75	96		128	132		900	miss
NONE	F.C./F.S. Ratio		<1	<1		1	1		<1	1		2	miss
70300	Res., Tot. Filt.	mg/ℓ	102	116		99	92		92	86		99	115
00530	Res., Tot. Nonf.	mg/ℓ	12	10		28	34		183	170		183	326
00076	Turbidity	Hach FTU	18	18		23	23		130	135		190	200
00900	Hardness (Calc.)	mg/ℓ	44.9	46.8		42.8	43.5		57.3	53.3		63.8	63.1

Dash (-) indicates duplicate analysis not required.

TABLE B-9 . Continued.

STORET CODE	PARAMETER	STATION	1	1 Dup.		5	5 Dup.		10	10 Dup.		17	17 Dup.
		DATE	3/1	3/1		2/28	2/28		2/26	2/26		2/27	2/27
		TIME											
		UNITS											
70996	ATP	mg/ℓ	-	-		-	-		-	-		-	-
00916	Ca, Total	mg/ℓ	6.7	7.4		6.2	6.5		3.0	3.7		8.5	8.0
00940	Cl	mg/ℓ	4	4		3	3		4	3		2	2
01046	Fe, Dissolved	μg/ℓ	67	72		214	172		151	249		308	362
74010	Fe, Total	mg/ℓ	0.79	0.88		1.70	1.52		11.23	8.96		16.22	16.41
00927	Mg, Total	mg/ℓ	6.33	6.33		5.79	5.79		7.01	6.54		3.14	3.21
01056	Mn, Dissolved	μg/ℓ	307	371		211	243		403	435		18	17
01055	Mn, Total	mg/ℓ	0.35	0.41		0.23	0.43		0.40	0.53		0.28	0.23
00610	NH_3	mg/ℓ	0.17	0.17		0.14	0.17		0.17	0.22		0.06	0.03
00630	NO_2-NO_3	mg/ℓ	0.76	0.78		0.69	0.68		0.69	0.72		0.25	0.23
00625	TKN	mg/ℓ	0.4	0.2		0.2	0.5		0.5	0.1		1.3	1.9
00640	TIN, (Calc.)	mg/ℓ	0.93	0.95		0.83	0.85		0.36	0.94		0.31	0.26
00605	TON, (Calc.)	mg/ℓ	0.2	<0.1		0.1	0.3		0.3	<0.1		1.2	1.9
00600	N, Total (Calc.)	mg/ℓ	1.1	1.0		0.9	1.1		1.2	0.9		1.5	2.2
00671	Diss. o-P	mg/ℓ	0.026	0.012		0.017	0.012		0.018	0.017		0.068	0.058
00665	P, Total	mg/ℓ	0.07	0.07		0.06	0.07		0.13	0.11		0.43	0.41
00937	K, Total	mg/ℓ	2.20	2.24		2.24	2.20		3.32	3.09		3.29	3.21
00929	Na, Total	mg/ℓ	8.16	7.51		6.92	7.31		7.31	7.38		7.31	3.40
00946	SO_4, Dissolved	mg/ℓ	35	35		33	33		35	35		10	8
00745	S, Total	mg/ℓ	<0.1	<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1
01092	Zn	μg/ℓ	<40	<40		<40	<40		<40	<40		46	62
00405	CO_2 (Calc.)	mg/ℓ	32	32		3	3		9	9		3	3

Dash (-) indicates duplicate analysis not required

TABLE B-10. Results of duplicate spiked analyses.
Middle Black Warrior and Tombigbee Rivers,
February 22 - March 2, 1979.

STORET CODE	PARAMETER	STATION	1 D		5 D		10 D		17 D
		DATE	3/1		2/28		2/26		2/27
		TIME							
		UNITS							
70996	ATP	mg/ℓ	-		-		-		-
00916	Ca, Total	mg/ℓ	106%		89%		122%		93%
00940	Cl	mg/ℓ	101%		104%		102%		96%
01046	Fe, Dissolved	µg/ℓ	-		-		-		-
74010	Fe, Total	mg/ℓ	120%		74%		140%		102%
00927	Mg, Total	mg/ℓ	96%		93%		90%		98%
01056	Mn, Dissolved	µg/ℓ	-		-		-		-
01055	Mn, Total	mg/ℓ	79%		114%		87%		106%
00610	NH_3	mg/ℓ	100%		107%		106%		103%
00630	NO_2-NO_3	mg/ℓ	104%		98%		104%		98%
00625	TKN	mg/ℓ	85%		85%		112%		98%
00681	DOC	mg/ℓ	105%		118%		133%		104%
00680	TOC	mg/ℓ	104%		104%		96%		101%
00600	N, Total (Calc.)	mg/ℓ	-		-		-		-
00671	Diss. o-P	mg/ℓ	92%		100%		97%		84%
00665	P, Total	mg/ℓ	122%		113%		122%		123%
00937	K, Total	mg/ℓ	89%		97%		80%		99%
00929	Na, Total	mg/ℓ	93%		107%		88%		99%
00946	SO_4, Dissolved	mg/ℓ	100%		88%		91%		94%
00745	S, Total	mg/ℓ	-		-		-		-
01092	Zn	µg/ℓ	97%		99%		104%		102%

Dash (-) indicates duplicate spiked analysis not required.

TABLE B-11. Results of duplicate analyses, Middle Black Warrior and Tombigbee Rivers, May 13-16, 1979.

STORET CODE	PARAMETER	STATION	1	1D		6	6D		17	17D		22	22D
		DATE											
		TIME											
		UNITS											
NONE	Depth	feet	-	-		-	-		-	-		-	-
00400	pH	S.U.	-	-		-	-		-	-		-	-
00010	Temperature	^{o}C	-	-		-	-		-	-		-	-
00299	DO	mg/ℓ	-	-		-	-		-	-		-	-
00090	ORP	mV	-	-		-	-		-	-		-	-
00094	Sp. Cond.	µmhos/cm	-	-		-	-		-	-		-	-
00077	Trans., S. D.	inches	-	-		-	-		-	-		-	-
00034	L. Trans.	feet	-	-		-	-		-	-		-	-
00410	Alk., Total	mg/ℓ	18	18		18	18		34	32		35	35
00681	DOC	mg/ℓ	4.1	4.1		3.8	3.9		7.4	4.7		7.3	4.8
00680	TOC	mg/ℓ	3.1	3.5		3.8	1.8		5.5	4.5		6.9	6.4
32211	Chlorophyll, a	µg/ℓ	1	2		3	sample lost		3	5		4	3
32212	Chlorophyll, b	µg/ℓ	1	3		1	in		<1	1		1	1
32214	Chlorophyll, c	µg/ℓ	4	11		3	centri-fuge		1	4		7	1
00080	Color, True	Pt. Co.	20	20		18	18		59	50		34	36
31616	Fecal Coliform	/100 mℓ	1010	1170		80	86		77	65		95	77
31673	Fecal Strep.	/100 mℓ	25	32		54	56		122	115		205	183
NONE	F.C./F.S. Ratio		40.4	36.6		1.5	1.5		0.6	0.6		0.5	0.4
70300	Res., Tot. Filt.	mg/ℓ	91	78		71	53		62	89		74	151
00530	Res., Tot. Nonf.	mg/ℓ	10	11		28	29		42	34		55	45
00076	Turbidity	Hach FTU	12	12		18	13		37	32		34	36
00900	Hardness (Calc.)	mg/ℓ	-	-		-	-		-	-		-	-

Dash (-) indicates duplicate analysis not performed.

TABLE B-11 . CONTINUED.

STORET CODE	PARAMETER	STATION	1	1D		6	6D		17	17D		22	22D
		DATE											
		TIME											
		UNITS											
70996	ATP	mg/ℓ	-	-		-	-		-	-		-	-
00916	Ca, Total	mg/ℓ	-	-		-	-		-	-		-	-
00940	Cl	mg/ℓ	-	-		-	-		-	-		-	-
01046	Fe, Dissolved	μg/ℓ	130	170		70	90		620	660		380	250
74010	Fe, Total	mg/ℓ	.66	.66		1.08	1.48		2.98	2.72		0.74	2.64
00927	Mg, Total	mg/ℓ	-	-		-	-		-	-		-	-
01056	Mn, Dissolved	μg/ℓ	235	240		280	280		20	25		62	56
01055	Mn, Total	mg/ℓ	0.09	0.11		.32	.29		.98	1.03		.23	.26
00610	NH_3	mg/ℓ	0.13	0.12		0.14	0.15		0.12	0.14		0.10	0.18
00630	NO_2-NO_3	mg/ℓ	0.65	0.67		0.75	0.62		0.18	0.22		0.66	0.62
00625	TKN	mg/ℓ	0.9	0.8		1.1	-		0.8	1.7		1.7	1.6
00640	TIN, (Calc.)	mg/ℓ	0.78	0.79		0.89	0.77		0.33	0.36		0.76	0.80
00605	TON, (Calc.)	mg/ℓ	0.8	0.7		1.0	-		0.7	1.6		1.6	1.4
00600	N, Total (Calc.)	mg/ℓ	1.6	1.5		1.9	-		1.0	2.0		2.4	2.2
00671	Diss. o-P	mg/ℓ	0.022	0.029		-	-		0.055	0.057		0.037	0.062
00665	P, Total	mg/ℓ	0.02	0.03		0.05	0.05		0.11	0.16		0.12	0.11
00937	K, Total	mg/ℓ	-	-		-	-		-	-		-	-
00929	Na, Total	mg/ℓ	-	-		-	-		-	-		-	-
00946	SO_4, Dissolved	mg/ℓ	30	30		26	26		7	7		20	20
00745	S, Total	mg/ℓ	<0.1	<0.1		<0.1	<0.1		<0.1	<0.1		<0.1	<0.1
01092	Zn	μg/ℓ	80	40		80	102		40	100		<40	<40

Dash (-) indicates duplicate analysis not performed.

TABLE B-12. Results of duplicate spiked analyses, Middle Black Warrior and Tombigbee Rivers. May 13 - 16, 1979.

STORET CODE	PARAMETER	STATION	1 D		6 D		17 D		22 D
		DATE	5/14		5/15		5/13		5/16
		TIME							
		UNITS							
70996	ATP	mg/ℓ	-		-		-		-
00681	DOC	mg/ℓ	*		108%		99%		91%
00680	TOC	mg/ℓ	*		110%		71%		99%
01046	Fe, Dissolved	μg/ℓ	138%		*		106%		97%
74010	Fe, Total	mg/ℓ	100%		83%		100%		108%
00927	Mg, Total	mg/ℓ	-		-		-		-
01056	Mn, Dissolved	μg/ℓ	65%		67%		93%		97%
01055	Mn, Total	mg/ℓ	114%		45%		95%		95%
00610	NH_3	mg/ℓ	109%		118%		108%		111%
00630	NO_2-NO_3	mg/ℓ	99%		104%		105%		101%
00625	TKN	mg/ℓ	118%		*		98%		104%
00640	TIN, (Calc.)	mg/ℓ	-		-		-		-
00605	TON, (Calc.)	mg/ℓ	-		-		-		-
00600	N, Total (Calc.)	mg/ℓ	-		-		-		-
00671	Diss. o-P	mg/ℓ	87%		*		93%		89%
00665	P, Total	mg/ℓ	95%		106%		84%		99%
00937	K, Total	mg/ℓ	-		-		-		-
00929	Na, Total	mg/ℓ	-		-		-		-
00946	SO_4, Dissolved	mg/ℓ	104%		101%		101%		107%
00745	S, Total	mg/ℓ	-		-		-		-
01092	Zn	μg/ℓ	-		-		-		-

Dash (-) indicates duplicate spiked analysis not required.
Asterisk (*) indicates duplicate spiked analysis not performed.

TABLE B-13. Results of duplicate analyses, Middle Black Warrior and Tombigbee Rivers, June 17 - 20, 1979.

STORET CODE	PARAMETER	STATION	4	4 D		7	7 D		17	17 D		22	22 D
		DATE	6/19	6/19		6/20	6/20		6/17	6/17		6/18	6/18
		TIME											
		UNITS											
NONE	Depth	feet	---	---		---	---		---	---		---	---
00400	pH	S.U.	---	---		---	---		---	---		---	---
00010	Temperature	°C	---	---		---	---		---	---		---	---
00299	DO	mg/ℓ	---	---		---	---		---	---		---	---
00090	ORP	mV	---	---		---	---		---	---		---	---
00094	Sp. Cond.	μmhos/cm	---	---		---	---		---	---		---	---
00077	Trans., S. D.	inches	---	---		---	---		---	---		---	---
00034	L. Trans.	feet	---	---		---	---		---	---		---	---
00410	Alk., Total	mg/ℓ	28	28		26	26		41	40		32	29
00681	DOC	mg/ℓ	<2	<2		<2	<2		<2	<2		<2	<2
00680	TOC	mg/ℓ	<2	<2		<2	<2		<2	<2		<2	<2
32211	Chlorophyll, a	μg/ℓ	10	10		6	6		5	2		10	8
32212	Chlorophyll, b	μg/ℓ	1	1		1	2		2	1		2	2
32214	Chlorophyll, c	μg/ℓ	1	3		2	3		4	3		4	4
00080	Color, True	Pt. Co.	20	20		10	10		15	15		23	20
31616	Fecal Coliform	/100 mℓ	66	83		4	3		<10	<10		5	7
31673	Fecal Strep.	/100 mℓ	49	54		59	49		170	140		6	9
NONE	F.C./F.S. Ratio		1	1		<1	<1		<1	<1		1	1
70300	Res., Tot. Filt.	mg/ℓ	137	135		120	105		86	96		123	109
00530	Res., Tot. Nonf.	mg/ℓ	28	27		11	14		18	16		17	16
00076	Turbidity	Hach FTU	22	21		7	8		20	20		23	20
00900	Hardness (Calc.)	mg/ℓ	---	---		---	---		---	---		---	---

Dash (---) indicates duplicate analysis not required.

TABLE B-13. Continued.

STORET CODE	PARAMETER	STATION	4	4 D		7	7 D		17	17 D		22	22 D
		DATE	6/19	6/19		6/20	6/20		6/17	6/17		6/18	6/18
		TIME											
		UNITS											
70996	ATP	mg/ℓ											
00916	Ca, Total	mg/ℓ	---	---		---	---		---	---		---	---
00940	Cl	mg/ℓ	---	---		---	---		---	---		---	---
01046	Fe, Dissolved	µg/ℓ	<50	<50		<50	<50		250	310		230	110
74010	Fe, Total	mg/ℓ	1.20	1.18		0.87	0.79		1.35	1.49		0.97	0.94
00927	Mg, Total	mg/ℓ	---	---		---	---		---	---		---	---
01056	Mn, Dissolved	µg/ℓ	<50	<50		<50	<50		<50	<50		<50	<50
01055	Mn, Total	mg/ℓ	0.175	0.175		0.078	0.062		0.115	0.095		0.128	0.075
00610	NH_3	mg/ℓ	0.28	0.20		0.10	0.12		0.24	0.26		0.23	0.17
00630	NO_2-NO_3	mg/ℓ	1.09	1.11		1.00	0.92		0.66	0.44		1.12	1.03
00625	TKN	mg/ℓ	0.4	0.6		0.6	0.3		0.6	0.4		1.1	0.6
00640	TIN, (Calc.)	mg/ℓ	1.37	1.31		1.10	1.04		0.90	0.70		1.35	1.20
00605	TON, (Calc.)	mg/ℓ	0.1	0.4		0.5	0.2		0.4	0.1		0.9	0.4
00600	N, Total (Calc.)	mg/ℓ	1.5	1.7		1.6	1.2		1.3	0.8		2.3	1.6
00671	Diss. o-P	mg/ℓ	0.026	0.030		0.022	0.059		0.042	0.039		0.025	0.027
00665	P, Total	mg/ℓ	0.08	0.06		0.03	0.03		0.12	0.11		0.07	0.13
00937	K, Total	mg/ℓ	---	---		---	---		---	---		---	---
00929	Na, Total	mg/ℓ	---	---		---	---		---	---		---	---
00946	SO_4, Dissolved	mg/ℓ	12	11		9	9		8	8		30	12
00745	S, Total	mg/ℓ	<0.1	<0.1		2.5	<0.1		<0.1	<0.1		<0.1	<0.1
01092	Zn	µg/ℓ	<10	<10		<10	<10		<10	<10		<10	<10

Dash (---) indicates duplicate analysis not required.

TABLE B-14. Results of duplicate spiked analyses, Middle Black Warrior and Tombigbee Rivers, June 17 - 20, 1979.

STORET CODE	PARAMETER	STATION	4 D		7 D		17 D		22 D
		DATE	6/19		6/20		6/17		6/18
		TIME							
		UNITS							
70996	ATP	mg/ℓ	----		----		----		----
00681	DOC	mg/ℓ	145%		90%		113%		101%
00680	TOC	mg/ℓ	87%		99%		99%		95%
01046	Fe, Dissolved	μg/ℓ	----		----		----		----
74010	Fe, Total	mg/ℓ	97%		130%		94%		121%
00927	Mg, Total	mg/ℓ	----		----		----		----
01056	Mn, Dissolved	μg/ℓ	----		----		----		----
01055	Mn, Total	mg/ℓ	116%		160%		125%		154%
00610	NH_3	mg/ℓ	103%		96%		98%		102%
00630	$NO_2 \cdot NO_3$	mg/ℓ	98%		101%		101%		Lost
00625	TKN	mg/ℓ	----		----		----		----
00640	TIN, (Calc.)	mg/ℓ	----		----		----		----
00605	TON, (Calc.)	mg/ℓ	----		----		----		----
00600	N, Total (Calc.)	mg/ℓ	----		----		----		----
00671	Diss. o-P	mg/ℓ	98%		88%		93%		90%
00665	P, Total	mg/ℓ	90%		95%		97%		90%
00937	K, Total	mg/ℓ	----		----		----		----
00929	Na, Total	mg/ℓ	----		----		----		----
00946	SO_4, Dissolved	mg/ℓ	90%		83%		83%		90%
00745	S, Total	mg/ℓ	----		----		----		----
01092	Zn	μg/ℓ	----		----		----		----

Dash (----) indicates duplicate spike analysis not required.

TABLE B-15. Results of duplicate analyses, Middle Black Warrior and Tombigbee Rivers, July 29 - August 1, 1979.

STORET CODE	PARAMETER	STATION	3	3 Dup		19	19 Dup		13	13 Dup		10	10 Dup
		DATE	7/29	7/29		7/30	7/30		7/31	7/31		8/1	8/1
		TIME											
		UNITS											
NONE	Depth	feet	---	---		---	---		---	---		---	---
00400	pH	S.U.	---	---		---	---		---	---		---	---
00010	Temperature	^oC	---	---		---	---		---	---		---	---
00299	DO	mg/ℓ	---	---		---	---		---	---		---	---
00090	ORP	mV	---	---		---	---		---	---		---	---
00094	Sp. Cond.	µmhos/cm	---	---		---	---		---	---		---	---
00077	Trans., S. D.	inches	---	---		---	---		---	---		---	---
00034	L. Trans.	feet	---	---		---	---		---	---		---	---
00410	Alk., Total	mg/ℓ	28	26		43	43		26.9	26.3		24.8	24.9
00681	DOC	mg/ℓ	5.1	3.6		6.5	*		4.6	4.8		6.6	6.9
00680	TOC	mg/ℓ	5.5	5.2		8.0	9.9		5.1	4.6		6.8	8.1
32211	Chlorophyll, a	µg/ℓ	7	8		8	9		9	9		8	7
32212	Chlorophyll, b	µg/ℓ	1	1		2	1		1	2		1	1
32214	Chlorophyll, c	µg/ℓ	2	<1		3	1		2	2		1	1
00080	Color, True	Pt. Co.	11	13		39	38		19	20		17	15
31616	Fecal Coliform	/100 mℓ	274	272		20	30		10	12		3	3
31673	Fecal Strep.	/100 mℓ	29	26		160	200		5350	2560		1410	1580
NONE	F.C./F.S. Ratio		9	10		<1	<1		<1	<1		<1	<1
70300	Res., Tot. Filt.	mg/ℓ	13	12		40	40		15	16		10	11
00530	Res., Tot. Nonf.	mg/ℓ	126	124		109	98		119	116		106	109
00076	Turbidity	Hach FTU	8	10		40	42		10	9		8	8
00900	Hardness (Calc.)	mg/ℓ	---	---		---	---		---	---		---	---

* Data point rejected due to apparent sample contamination.
Dash (---) indicates duplicate analysis not required.

TABLE B-15. Continued.

STORET CODE	PARAMETER	STATION	3	3 Dup		19	19 Dup		13	13 Dup		10	10 Dup
		DATE	7/29	7/29		7/30	7/30		7/31	7/31		8/1	8/1
		TIME											
		UNITS											
70996	ATP	mg/ℓ	---	---		---	---		---	---		---	---
00916	Ca, Total	mg/ℓ	---	---		---	---		---	---		---	---
00940	Cl	mg/ℓ	---	---		---	---		---	---		---	---
01046	Fe, Dissolved	μg/ℓ	60	60		510	460		110	60		60	110
74010	Fe, Total	mg/ℓ	0.56	0.61		2.85	2.64		0.92	0.71		0.82	0.97
00927	Mg, Total	mg/ℓ	---	---		---	---		---	---		---	---
01056	Mn, Dissolved	μg/ℓ	<50	<50		<50	<50		<50	<50		<50	<50
01055	Mn, Total	mg/ℓ	0.080	0.091		<.05	<.05		<.05	<.05		<.05	<.05
00610	NH_3	mg/ℓ	0.24	0.27		0.24	0.18		0.16	0.19		0.30	0.25
00630	NO_2-NO_3	mg/ℓ	0.64	0.65		0.24	0.24		0.47	0.48		0.48	0.46
00625	TKN	mg/ℓ	---	---		---	---		---	---		---	---
00640	TIN, (Calc.)	mg/ℓ	---	---		---	---		---	---		---	---
00605	TON, (Calc.)	mg/ℓ	---	---		---	---		---	---		---	---
00600	N, Total (Calc.)	mg/ℓ	---	---		---	---		---	---		---	---
00671	Diss. o-P	mg/ℓ	0.013	0.015		0.050	0.053		0.015	0.017		0.019	0.019
00665	P, Total	mg/ℓ	0.05	0.07		0.16	0.16		Miss	0.07		0.07	0.10
00937	K, Total	mg/ℓ	---	---		---	---		---	---		---	---
00929	Na, Total	mg/ℓ	---	---		---	---		---	---		---	---
00946	SO_4, Dissolved	mg/ℓ	51	50		10	11		37	38		28	28
00745	S, Total	mg/ℓ	<0.1	<0.1		0.3	0.3		<0.1	<0.1		<0.1	<0.1
01092	Zn	μg/ℓ	59	44		24	24		74	74		20	20

Note: Dash (---) indicates duplicate analysis not required.

TABLE B-16. Results of duplicate spiked analyses, Middle Black Warrior and Tombigbee Rivers, July 29 - August 1, 1979.

STORET CODE	PARAMETER	STATION	3 Dup.		19 Dup		13 Dup		10 Dup
		DATE	7/29		7/30		7/31		8/1
		TIME							
		UNITS							
70996	ATP	mg/ℓ	---		---		---		---
00681	DOC	mg/ℓ	109 %		103 %		97 %		97 %
00680	TOC	mg/ℓ	112 %		94 %		92 %		88%
01046	Fe, Dissolved	μg/ℓ	115 %		118 %		115 %		110 %
74010	Fe, Total	mg/ℓ	91 %		111 %		101 %		98 %
00927	Mg, Total	mg/ℓ	---		---		---		---
01056	Mn, Dissolved	μg/ℓ	---		---		---		---
01055	Mn, Total	mg/ℓ	139 %		96 %		106 %		119 %
00610	NH_3	mg/ℓ	89 %		109 %		104 %		102 %
00630	NO_2-NO_3	mg/ℓ	99 %		100 %		102 %		100 %
00625	TKN	mg/ℓ	*		*		*		*
00640	TIN, (Calc.)	mg/ℓ	---		---		---		---
00605	TON, (Calc.)	mg/ℓ	---		---		---		---
00600	N, Total (Calc.)	mg/ℓ	---		---		---		---
00671	Diss. o-P	mg/ℓ	102 %		93 %		98 %		94 %
00665	P, Total	mg/ℓ	100 %		100 %		91 %		108 %
00937	K, Total	mg/ℓ	---		---		---		---
00929	Na, Total	mg/ℓ	---		---		---		---
00946	SO_4, Dissolved	mg/ℓ	96 %		94 %		97 %		96 %
00745	S, Total	mg/ℓ	---		---		---		---
01092	Zn	μg/ℓ	105 %		118 %		84 %		115 %

Notes: Dash (---) indicates spiked duplicate analysis not required.

* Data for TKN rejected due to instrument failure.

TABLE B-17. Results of duplicate analyses, Middle Black Warrior and Tombigbee Rivers, August 26 - 29, 1979.

STORET CODE	PARAMETER	STATION	1	1 Dup		6	6 Dup		17	17 Dup		22	22 Dup
		DATE	8/26	8/26		8/29	8/29		8/27	8/27		8/28	8/28
		TIME											
		UNITS											
NONE	Depth	feet	---	---		---	---		---	---		---	---
00400	pH	S.U.	---	---		---	---		---	---		---	---
00010	Temperature	°C	---	---		---	---		---	---		---	---
00299	DO	mg/ℓ	---	---		---	---		---	---		---	---
00090	ORP	mV	---	---		---	---		---	---		---	---
00094	Sp. Cond.	μmhos/cm	---	---		---	---		---	---		---	---
00077	Trans., S. D.	inches	---	---		---	---		---	---		---	---
00034	L. Trans.	feet	---	---		---	---		---	---		---	---
00410	Alk., Total	mg/ℓ	26	26		28	29		46	46		39	39
00681	DOC	mg/ℓ	5.4	4.9		5.1	4.7		7.1	4.5		6.6	6.0
00680	TOC	mg/ℓ	4.9	4.3		6.0	5.5		2.9	3.8		7.5	8.9
32211	Chlorophyll, a	μg/ℓ	3	2		14	16		8	*		11	13
32212	Chlorophyll, b	μg/ℓ	1	1		3	3		1	*		2	1
32214	Chlorophyll, c	μg/ℓ	1	2		5	2		1	*		2	4
00080	Color, True	Pt. Co.	10	10		10	10		20	21		10	12
31616	Fecal Coliform	/100 mℓ	920	940		20	14		42	34		50	81
31673	Fecal Strep.	/100 mℓ	110	190		340	320		230	160		490	520
NONE	F.C./F.S. Ratio		<1	<1		<1	<1		<1	<1		<1	<1
70300	Res., Tot. Filt.	mg/ℓ	130	121		109	96		82	83		95	95
00530	Res., Tot. Nonf.	mg/ℓ	2	2		13	12		24	21		9	9
00076	Turbidity	Hach FTU	5	5		8	8		20	21		9	10
00900	Hardness (Calc.)	mg/ℓ	79	77		71	67		64	62		64	59

* Indicates sample lost.
Dash (---) indicates duplicate analysis not required.

TABLE B-17. Continued.

STORET CODE	PARAMETER	STATION	1	1 Dup		6	6 Dup		17	17 Dup		22	22 Dup
		DATE	8/26	8/26		8/29	8/29		8/27	8/27		8/28	8/28
		TIME											
		UNITS											
70996	ATP	mg/ℓ	---	---		---	---		---	---		---	---
00916	Ca, Total	mg/ℓ	17.6	17.2		16.5	15.3		21.7	21.2		19.8	18.1
00940	Cl	mg/ℓ	4	4		7	7		10	10		7	7
01046	Fe, Dissolved	µg/ℓ	50	50		30	20		20	50		180	50
74010	Fe, Total	mg/ℓ	0.30	0.38		0.51	0.41		1.03	1.03		0.59	0.59
00927	Mg, Total	mg/ℓ	8.3	8.1		6.9	6.7		1.8	1.7		3.2	3.1
01056	Mn, Dissolved	µg/ℓ	270	250		30	10		70	110		20	10
01055	Mn, Total	mg/ℓ	0.17	0.13		0.09	0.09		0.16	0.15		0.08	0.08
00610	NH_3	mg/ℓ	0.26	0.20		0.06	0.04		0.19	0.19		0.22	0.17
00630	NO_2-NO_3	mg/ℓ	0.72	0.74		0.46	0.47		0.12	0.11		0.54	0.19
00625	TKN	mg/ℓ	0.9	1.0		0.4	0.5		1.0	0.9		0.5	0.6
00640	TIN, (Calc.)	mg/ℓ	0.98	0.94		0.52	0.51		0.31	0.30		0.76	0.36
00605	TON, (Calc.)	mg/ℓ	0.6	0.8		0.3	0.5		0.8	0.7		0.3	0.4
00600	N, Total (Calc.)	mg/ℓ	1.6	1.7		0.8	1.0		1.1	1.0		1.1	0.8
00671	Diss. o-P	mg/ℓ	0.083	0.073		0.011	0.018		0.092	0.135		0.008	0.008
00665	P, Total	mg/ℓ	0.04	0.04		0.03	0.02		0.07	0.07		0.03	0.03
00937	K, Total	mg/ℓ	2.7	2.7		2.4	2.3		2.1	2.0		1.9	1.9
00929	Na, Total	mg/ℓ	10.0	9.5		9.5	9.4		5.7	5.5		6.5	6.1
00946	SO_4, Dissolved	mg/ℓ	53	53		47	45		9	10		19	20
00745	S, Total	mg/ℓ	<0.1	<0.1		<0.1	<0.1		<0.1	<0.1		<0.3	<0.3
01092	Zn	µg/ℓ	14	14		10	10		19	16		10	10

Dash (---) indicates duplicate analysis not required.

TABLE B-18. Results of duplicate spiked analyses, Middle Black Warrior-Tombigbee Rivers, August 26 - 29, 1979.

STORET CODE	PARAMETER	STATION	1 Dup		6 Dup		17 Dup		22 Dup
		DATE	8/26		8/29		8/27		8/28
		TIME							
		UNITS							
70996	ATP	mg/ℓ	---		---		---		---
00916	Ca, Total	mg/ℓ	102%		100%		108%		96%
00940	Cl	mg/ℓ	109%		102%		99%		101%
01046	Fe, Dissolved	µg/ℓ	85%		153%		211%		70%
74010	Fe, Total	mg/ℓ	73%		97%		97%		96%
00927	Mg, Total	mg/ℓ	93%		98%		95%		96%
01056	Mn, Dissolved	µg/ℓ	72%		73%		96%		136%
01055	Mn, Total	mg/ℓ	70%		85%		69%		90%
00610	NH_3	mg/ℓ	98%		100%		92%		104%
00630	NO_2-NO_3	mg/ℓ	96%		99%		98%		103%
00625	TKN	mg/ℓ	95%		94%		132%		88%
00681	DOC	mg/ℓ	103%		98%		107%		112%
00680	TOC	mg/ℓ	99%		99%		114%		106%
00600	N, Total (Calc.)	mg/ℓ	---		---		---		---
00671	Diss. o-P	mg/ℓ	100%		102%		100%		91%
00665	P, Total	mg/ℓ	108%		114%		107%		113%
00937	K, Total	mg/ℓ	97%		94%		103%		97%
00929	Na, Total	mg/ℓ	108%		103%		100%		98%
00946	SO_4, Dissolved	mg/ℓ	117%		105%		97%		107%
00745	S, Total	mg/ℓ	---		---		---		---
01092	Zn	µg/ℓ	101%		92%		109%		99%

Dash (---) indicates spiked duplicate analysis not required.

TABLE B-19. Results of duplicate analyses, Middle Black Warrior and Tombigbee Rivers, October 1 - 3, 1979.

STORET CODE	PARAMETER	STATION	1	1 Dup		10	10 Dup		21	21 Dup
		DATE	10/1	10/1		10/2	10/2		10/3	10/3
		TIME								
		UNITS								
NONE	Depth	feet	---	---		---	---		---	---
00400	pH	S.U.	---	---		---	---		---	---
00010	Temperature	°C	---	---		---	---		---	---
00299	DO	mg/ℓ	---	---		---	---		---	---
00090	ORP	mV	---	---		---	---		---	---
00094	Sp. Cond.	umhos/cm	---	---		---	---		---	---
00077	Trans., S. D.	inches	---	---		---	---		---	---
00034	L. Trans.	feet	---	---		---	---		---	---
00410	Alk., Total	mg/ℓ	30	32		26	27		40	40
00681	DOC	mg/ℓ	<2	<2		4.5	4.1		7.0	6.4
00680	TOC	mg/ℓ	<2	< 2		3.9	4.1		7.0	7.9
32211	Chlorophyll, a	μg/ℓ	2	3		2	2		5	4
32212	Chlorophyll, b	μg/ℓ	1	1		1	1		1	1
32214	Chlorophyll, c	μg/ℓ	<1	<1		<1	<1		<1	<1
00080	Color, True	Pt. Co.	7	7		7	7		95	94
31616	Fecal Coliform	/100 mℓ	320	360		121	133		5	7
31673	Fecal Strep.	/100 mℓ	100	200		81	95		22	24
NONE	F.C./F.S. Ratio		3	2		1	1		<1	<1
70300	Res., Tot. Filt.	mg/ℓ	157	141		163	135		88	96
00530	Res., Tot. Nonf.	mg/ℓ	5	6		6	5		12	10
00076	Turbidity	Hach FTU	5	5		13	14		18	18
00900	Hardness (Calc.)	mg/ℓ	---	---		---	---		---	---

Dash (---) indicates analysis not required.

TABLE B-13. Continued.

STORET CODE	PARAMETER	STATION	1	1 Dup		10	10 Dup		21	21 Dup	
		DATE	10/1	10/1		10/2	10/2		10/3	10/3	
		TIME									
		UNITS									
70996	ATP	mg/ℓ	---	---		---	---		---	---	
00916	Ca, Total	mg/ℓ	---	---		---	---		---	---	
00940	Cl	mg/ℓ	---	---		---	---		---	---	
01046	Fe, Dissolved	μg/ℓ	<50	<50		60	20		390	390	
74010	Fe, Total	mg/ℓ	0.34	0.36		0.94	1.01		1.75	1.66	
00927	Mg, Total	mg/ℓ	---	---		---	---		---	---	
01056	Mn, Dissolved	μg/ℓ	80	83		52	50		<50	<50	
01055	Mn, Total	mg/ℓ	0.17	0.17		0.13	0.14		0.08	0.04	
00610	NH_3	mg/ℓ	0.06	0.04		0.40*	0.09		0.10	0.08	
00630	NO_2-NO_3	mg/ℓ	0.78	0.78		0.79	0.66		0.07	0.08	
00625	TKN	mg/ℓ	0.6	0.3		1.0	0.7		0.9	0.9	
00640	TIN, (Calc.)	mg/ℓ	0.8	0.8		1.2	0.8		0.2	0.2	
00605	TON, (Calc.)	mg/ℓ	0.54	0.26		0.60	0.61		0.80	0.82	
00600	N, Total (Calc.)	mg/ℓ	1.3	1.1		1.8	1.4		1.0	1.0	
00671	Diss. o-P	mg/ℓ	0.015	0.011		0.005	0.008		0.040	0.044	
00665	P, Total	mg/ℓ	0.02	0.02		0.04	0.05		0.10	0.10	
00937	K, Total	mg/ℓ	---	---		---	---		---	---	
00929	Na, Total	mg/ℓ	---	---		---	---		---	---	
00946	SO_4, Dissolved	mg/ℓ	50	55		60	60		7	8	
00745	S, Total	mg/ℓ	.09	.09		.09	.09		.10	.12	
01092	Zn	μg/ℓ	52	45		10	12		<10	<10	

Dash (---) indicates analysis not required.
Asterisk (*) indicates sample container apparently contaminated.

TABLE B-20. Results of duplicate spiked analyses, Middle Black Warrior and Tombigbee Rivers, October 1 - 3, 1979.

STORET CODE	PARAMETER	STATION	1 Dup		10 Dup		21 Dup
		DATE	10/1		10/2		10/3
		TIME					
		UNITS					
70996	ATP	mg/ℓ	---		---		---
00681	DOC	mg/ℓ	103%		90%		98%
00680	TOC	mg/ℓ	103%		92%		102%
01046	Fe, Dissolved	µg/ℓ	102%		104%		104%
74010	Fe, Total	mg/ℓ	110%		98%		105%
00927	Mg, Total	mg/ℓ	---		---		---
01056	Mn, Dissolved	µg/ℓ	82%		84%		98%
01055	Mn, Total	mg/ℓ	101%		96%		98%
00610	NH_3	mg/ℓ	100%		104%		106%
00630	NO_2-NO_3	mg/ℓ	Miss		104%		98%
00625	TKN	mg/ℓ	133%		160%		117%
00640	TIN, (Calc.)	mg/ℓ	---		---		---
00605	TON, (Calc.)	mg/ℓ	---		---		---
00600	N, Total (Calc.)	mg/ℓ	---		---		---
00671	Diss. o-P	mg/ℓ	107%		95%		98%
00665	P, Total	mg/ℓ	103%		142%		99%
00937	K, Total	mg/ℓ	---		---		---
00929	Na, Total	mg/ℓ	---		---		---
00946	SO_4, Dissolved	mg/ℓ	107%		119%		108%
00745	S, Total	mg/ℓ	---		---		---
01092	Zn	µg/ℓ	90%		95%		120%

Dash (---) indicates analysis not required.

APPENDIX C

TRIBUTARY STATION IN-SITU MEASUREMENTS

TABLE C-1 . Physical-Chemical measurements, Tributary Stations, Middle Black Warrior-Tombigbee Rivers, July 30 - August 4, 1978.

Station Number	Date	Time	Total Depth ft	Stream Velocity ft/sec	Depth Sampled ft	pH S.U.	Temp. °C	Dissolved Oxygen mg/l	Oxidation Reduction Potential mV	Specific Conductance µmhos/cm	Turbidity Hach FTU	Air Temp °F	Cloud Cover %
T-1	7/30	1630	4.0	0.5	2.0	7.1	29.0	7.8	270	100	10	88	50
T-2						- STATION MISSED -							
T-3	7/30	1700	4.0	1.0	2.0	7.5	28.5	7.9	320	95	8	88	-
T-4	7/31	1350	2.5	<0.5	1.3	6.3	27.5	5.5	360	40	12	91	60
T-5	7/31	1445	10.0	-	5.0	8.5	29.5	9.7	290	160	7	94	40
T-6	7/31	1740	13.0	<0.5	6.5	8.0	27.5	9.6	330	180	5	82	90
T-7	8/1	1245	4.0	<0.5	2.0	6.9	28.9	6.9	280	410	4	90	20
T-8	8/1	1800	5.0	-	2.5	8.4	27.5	8.5	300	190	6	78	80
T-9	8/2	1225	17.0	<0.5	8.5	7.7	28.0	3.8	330	225	4	91	10
T-10	8/2	1605	13.0	<0.5	6.5	9.1	29.5	11.0	280	215	6	94	5
T-11	8/3	1605	10.0	<0.5	5.0	7.7	29.5	6.1	350	70	42	94	-
T-12	8/4	1205	10.0	<0.5	5.0	8.6	29.0	9.4	315	150	4	87	50
D-1	7/30	1510	10.0	-	5.0	7.1	29.5	7.8	320	180	9	90	50
D-2	8/2	1400	14.0	-	-	7.5	32.0	7.2	360	190	5	94	-
D-3	8/2	1410	1.0	-	0.5	7.8	32.5	7.1	330	430	1	94	-
D-4	8/3	1805	15.0	0.5	5.0	8.7	30.5	10.0	310	30	8	94	0
D-5	8/4	1355	7.0	<0.5	-	7.2	30.0	4.5	365	150	6	90	60
D-6	9/3	1025	2.0	-	1.0	7.4	29.0	7.2	315	170	5	88	5-10
D-7	8/3	1010	1.5	-	0.8	6.1	29.5	8.4	280	810	37	88	5-10
R-11 B*	8/1	1920	16.0	-	-	8.0	28.0	9.0	360	175	2	79	-
R-11 A*	8/1	1730	15.0	-	5.0	8.1	29.5	9.8	310	170	2	79	-

Dash (-) indicates data not recorded.
* Before and After dewatering lock.

TABLE C-2. Physical-Chemical measurements, Tributary Stations, Middle Black Warrior-Tombigbee Rivers, August 27 - 31,1978.

Station Number	Date	Time	Total Depth ft	Stream Velocity ft/sec	Depth Sampled ft	pH S.U.	Temp. °C	Dissolved Oxygen mg/l	Oxidation Reduction Potential mV	Specific Conductance µmhos/cm	Turbidity Hach FTU	Air Temp °F	Cloud Cover %
T 1	8/28	1650	2	-	1	7.3	27.5	8.6	320	90	9	95	20
T-2	8/28	1705	3	-	1.5	7.3	26.0	7.5	310	40	1.7	91	20
T-3	8/28	1730	3	-	1.5	7.6	27.5	8.0	310	90	5	91	10
T-4	8/29	1100	2	-	1	6.7	27.0	6.0	90	70	10	84	100
T-5	8/29	1445	13	-	5	7.3	28.0	8.6	330	90	6	89	100
T-6	8/29	1725	30	-	5	7.1	28.0	6.2	340	145	8	87	100
T-7	8/30	0920	5	-	2.5	6.7	25.5	5.0	190	290	7	82	100
T-8	8/30	1545	5	-	2.5	8.2	28.0	7.6	290	200	28	78	100
T-9	8/31	1000	8	-	4	7.6	25.5	4.2	320	230	13	77	67
T-10	8/31	1430	10	-	5	7.8	27.5	4.4	310	220	17	82	25
T-11	8/26	1230	8	-	4	8.3	28.3	5.4	300	140	32	92	2
T-12	8/27	1730	15	-	5	8.9	29.0	9.9	260	50	5	-	-
D-1	8/28	1550	14	-	5	7.3	30.5	8.4	320	210	6	95	20
D-2	8/31	1230	12	-	5	7.3	26.0	7.8	320	170	6	82	25
D-3	8/31	1235	3	-	1.5	7.2	28.0	7.5	230	420	2	82	25
D-4	8/26	1000	15	-	5	6.9	29.0	9.2	255	160	3	95	10
D-5	8/31	1800	-	-	-	8.2	28.5	6.7	275	165	8	-	-
D-6	9/1	1050	2	-	1	7.1	27.0	5.4	330	180	6	-	33
R-11 B*	8/30	1640	15	-	5	7.2	28.0	6.8	320	165	9	80	90
R-11 A*	8/30	1525	15	-	5	7.0	28.0	7.0	330	170	16	78	100

* Before and After dewatering lock.
Dash (-) indicates data not recorded.

TABLE C-3. Physical-Chemical measurements, Tributary Stations, Middle Black Warrior-Tombigbee Rivers, October 1 - 5, 1978.

Station Number	Date	Time	Total Depth ft	Stream Velocity ft/sec	Depth Sampled ft	pH S.U.	Temp. °C	Dissolved Oxygen mg/l	Oxidation Reduction Potential mV	Specific Conductance µmhos/cm	Turbidity Hach FTU	Air Temp °F	Cloud Cover %
T-1	10/2	1310	4	-	2	7.0	23.0	8.4	300	80	15	79	0
T-2	10/2	1320	1	-	0.5	7.6	21.0	8.7	260	40	23	79	0
T-3	10/2	1345	4	-	2	7.6	21.5	8.9	310	100	6	79	0
T-4	10/2	1530	3	-	1.5	6.3	23.0	8.2	365	35	16	80	0
T-5	10/2	1625	8	-	4	7.2	24.0	8.2	330	110	13	80	0
T-6	10/2	1830	10	-	5	7.2	24.0	6.3	345	200	4	70	0
T-7	10/3	0910	14	-	5	7.3	19.0	8.0	360	170	8	64	0
T-8	10/3	1615	4	-	2	7.5	25.0	8.8	330	280	6	82	5
T-9	10/4	1145	10	-	5	6.9	26.0	9.1	305	200	2	78	0
T-10	10/4	1445	10	-	5	7.3	26.0	10.6	280	220	8	80	0
T-11	10/1	1235	7	-	3.5	8.2	23.0	6.9	290	170	-	80	10
T-12	10/5	1000	6	-	3	7.6	22.0	6.9	340	180	3	70	85
D-1	10/2	1200	2	2	1	7.4	24.0	8.0	305	1000	12	75	0
D-2	10/4	1245	12	0.5	5	7.3	26.0	7.8	325	185	4	82	0
D-3	10/4	1300	3	0.3	1.5	7.4	30.0	7.7	290	230	110	82	0
D-4	10/1	1450	7	-	3.5	8.1	25.0	7.8	300	170	22	83	5
D-5	10/5	1045	6	-	3	7.8	21.0	7.8	345	185	7	74	40
D-6	10/5	1730	6	-	3	6.3	25.0	7.9	315	280	6	73	0
R-11 B*	10/3	1710	15	-	5	7.5	26.0	8.8	345	195	6	83	30

* Before dewatering lock. Results After dewatering not recorded.
Dash (-) indicates data not recorded.

TABLE C-4 . Physical-Chemical measurements, Tributary Stations, Middle Black Warrior-Tombigbee Rivers, December 10 - 14, 1978.

STATION NUMBER	DATE	TIME	TOTAL DEPTH feet	STREAM VELO. ft/sec	DEPTH SAMPLED feet	pH S.U.	TEMP. °C	DISS. OXYGEN mg/ℓ	OXIDATION REDUCTION POTENTIAL mV	SP. COND. µmhos/cm	TURB. Hach FTU	AIR TEMP. °F	CLOUD COVER %
D-1	12/12	1000	25	nil	5	7.5	12.0	9.8	325	350	34	50	0
T-1	12/12	1110	4	<1	2	7.4	7.5	10.8	290	80	40	53	0
T-2	12/12	1115	1.5	<1	1	7.6	6.5	12.5	200	40	41	53	0
T-3	12/12	1135	3.5	<1	2	7.6	6.5	12.6	290	50	40	53	0
T-4	12/12	1300	2	<1	1	7.2	8.5	12.2	330	30	20	60	0
T-5	12/12	1400	1	0	5	6.7	9.0	11.9	340	30	40	54	0
T-6	12/12	1510	*	0	5	7.3	10.0	9.0	310	160	36	57	0
T-7	12/12	1542	*	0	5	7.2	12.0	9.2	310	120	49	56	0
T-8	12/13	0915	*	<1	5	*	9.5	9.9	295	220	51	56	50
R-11 B **	12/13	1030	*	0	5	*	11.5	10.4	310	170	54	miss	50
R-11 A **	12/13	0850	*	0	5	*	8.5	9.6	320	175	96	43	50
T-9	12/13	1330	*	0	5	*	11.0	10.1	305	225	33	60	50
D-2	12/13	1440	*	0	5	*	15.5	10.4	320	165	33	64	50
D-3	12/13	1445	1	0	5	*	14.0	11.1	180	460	6	64	50
T-10	12/13	1606	9	0	5	*	12.0	11.3	280	220	11	58	50
T-11	12/10	1150	miss	1	5	8.1	9.0	10.0	220	170	108	40	60
D-4	12/10	[illegible]	1	0	0.5	*	*	*	*	*	85	42	60
T-12	12/14	1530	*	0	5	*	9.0	10.1	300	160	23	50	10
D-5	12/14	1515	*	0	5	*	9.5	9.9	300	170	20	50	10
D-6	12/14	1106	*	nil	1	*	9.5	10.0	330	140	48	45	10

* Instrument malfunction.
** Before and After dewatering lock.

TABLE C-5 . Physical-Chemical measurements, Tributary Stations, Middle Black Warrior-Tombigbee Rivers, February 27 - March 2, 1979.

Station Number	Date	Time	Total Depth ft	Stream Velocity ft/sec	Depth Sampled ft	pH S.U.	Temp. °C	Dissolved Oxygen mg/l	Oxidation Reduction Potential mV	Specific Conductance µmhos/cm	Turbidity Hach FTU	Air Temp °F	Cloud Cover %
D1	3/1	1358	20	3	5	7.2	11.0	11.1	390	160	20	73	20
T1	3/1	1445	12	<1	5	6.4	13.5	12.2	400	70	26	71	0
T2	3/1	1452	7	<1	3.5	6.2	13.5	13.4	415	45	47	71	0
T3	3/1	1510	12	<1	5	6.6	13.5	13.5	400	45	22	71	5
T4	2/28	1016	9	2	4.5	6.7	9.5	9.0	390	105	23	62	90
T5	2/28	1111	15	<1	5	6.6	11.0	9.1	410	110	12	60	100
T6	2/28	1215	14	<1	5	6.2	11.0	8.8	420	50	34	64	100
T7	2/28	1255	26	<1	5	5.7	11.0	8.7	460	40	26	59	100
T8	2/26	1125	22	<1	5	7.1	10.0	11.2	410	160	38	45	0
R11-Bef *	2/26	1130	31	4	5	6.8	9.0	11.8	415	150	47	45	10
R11-Aft*	2/26	0915	32	4	5	6.6	9.0	11.5	430	150	21	47	10
T9	2/26	1422	24	<1	5	7.7	14.5	8.0	380	200	21	56	10
D2	2/26	1500	22	<1	5	7.1	14.5	11.1	390	160	37	58	0
D3	2/26	1515	5	<1	2.5	5.1	9.5	11.8	420	420	5	59	0
T10	2/26	1616	25	<1	5	8.0	10.5	9.9	330	290	110	58	0
T11	2/27	0905	35	4	5	7.3	10.5	9.5	400	120	miss	40	50
D4	2/27	1130	12	<1	5	7.1	10.5	9.4	380	110	140	52	50
T12	2/27	1450	25	<1	5	7.3	15.0	8.3	370	160	50	62	10
D5	2/27	1518	18	<1	5	7.5	15.0	9.6	380	130	70	62	10
D6	2/27	1620	12	<1	5	7.4	10.5	9.7	370	130	95	61	25

* Before and After dewatering lock.

TABLE C-6 . Physical-chemical measurements, Tributary Stations, Middle Black Warrior-Tombigbee Rivers, May 13-16, 1979.

Station Number	Date	Time	Total Depth ft	Stream Velocity ft/sec	Depth Sampled ft	pH S.U.	Temp. °C	Dissolved Oxygen mg/l	Oxidation Reduction Potential mV	Specific Conductance µmhos/cm	Turbidity Hach FTU	Air Temp °F	Cloud Cover %
D1	5/14	1250	10	1.5	5	6.8	20.0	3.6	380	140	19	76	10
T1	5/14	1340	5	0.5	2.5	6.8	19.5	7.6	410	90	37	78	10
T2	5/14	1345	3	0.5	1.5	6.8	19.0	9.2	385	40	25	77	10
T3	5/14	1405	6	2.5	3	6.7	18.5	8.7	410	40	46	77	10
T4	5/14	1625	6	0.5	3	6.3	19.0	6.8	440	50	22	81	10
T5	5/15	0920	7	nil	3.5	6.8	21.5	8.6	400	120	8	72	0
T6	5/15	1115	21	nil	5	6.7	20.5	8.0	420	125	10	78	0
T7	5/15	1230	10	nil	5	6.7	23.5	8.3	410	140	6	83	0
T8	5/15	1610	8	nil	4	7.2	21.0	6.7	390	210	16	82	0
R11-B *	5/15	1712	15	nil	5	6.8	22.0	8.7	420	140	19	84	25
R11-A *	5/15	1550	15	nil	5	6.8	22.5	8.3	420	140	19	87	20
T9	5/16	1455	13	nil	5	8.7	23.5	11.2	320	225	13	84	0
D2	5/16	1405	14	nil	5	6.8	26.0	8.8	390	140	14	84	0
D3	5/16	1400	3	nil	1.5	7.0	26.5	8.2	360	240	8	84	0
T10	5/16	1240	12	nil	5	8.5	24.5	9.4	330	240	8	81	0
T11	5/13	1200	24	2	5	8.2	21.0	9.0	360	100	158	64	100
D4	5/13	1340	1.5	nil	1	7.6	20.5	8.0	380	100	60	64	50
T12	5/13	1920	18	nil	5	7.6	22.0	8.1	missed	125	16	66	30
D5	5/13	1745	6	nil	3	7.2	21.0	7.1	400	110	18	68	90
D6	5/16	0950	14	>0.5	5	7.2	22.0	7.8	370	130	38	75	0

* Before and After dewatering lock.

TABLE C-7. Physical-chemical measurements, Tributary Stations, Middle Black Warrior - Tombigbee Rivers, June 17 - 20, 1979.

Station Number	Date	Time	Total Depth ft	Stream Velocity ft/sec	Depth Sampled ft	pH S.U.	Temp. °C	Dissolved Oxygen mg/l	Oxidation Reduction Potential mV	Specific Conductance µmhos/cm	Turbidity Hach FTU	Air Temp °F	Cloud Cover %
T - 1	6/19	1405	3	nil	1.5	6.8	26.0	7.1	400	90	16	92	10
T - 2	6/19	1410	1	0.5	0.5	6.7	25.5	7.8	390	60	20	92	10
T - 3	6/19	1430	5	<0.5	2.5	7.1	28.0	7.9	390	90	9	91	10
T - 4	6/19	1615	1	0.5	0.5	6.1	24.0	6.0	440	40	15	93	10
T - 5	6/20	0940	5	nil	2.5	8.2	28.5	10.1	385	160	7	84	20
T - 6	6/20	1115	17	nil	5	7.2	27.5	8.5	380	175	7	85	10
T - 7	6/20	1255	8	nil	4	7.2	27.5	8.5	390	160	5	90	0
T - 8	6/20	1605	5	<0.5	2.5	7.2	28.0	8.0	390	180	17	92	20
T - 9	6/18	1259	15	<1	5	8.9	30.0	13.0	270	195	20	91	20
T - 10	6/18	1215	1	nil	0.5	8.3	29.0	7.5	320	230	19	89	10
T - 11	6/17	1050	11	nil	5	7.7	25.0	7.1	380	120	43	87	10
T - 12	6/17	1720	10	nil	5	9.0	28.5	14.4	290	170	7	90	10
D - 1	6/19	1250	--	--	5	6.7	26.0	9.4	400	220	20	92	10
D - 2	6/18	1323	13	nil	5	7.1	31.5	8.6	350	170	9	90	20
D - 3	6/18	1318	1	1.5	0.5	5.8	30.5	7.5	320	430	4	90	20
D - 4	6/17	1245	0.1	3	0.1	7.1	32.0	9.0	310	130	38	90	10
D - 5	6/17	1735	6	nil	3	8.7	27.5	9.1	300	140	10	89	10
D - 6	6/18	0940	6	--	3	Miss	28.5	9.6	330	400	16	84	10
11 After	6/20	1553	12	--	5	7.1	27.5	7.6	410	180	13	93	20
11 Before	6/20	1700	12	--	5	7.0	27.5	7.5	420	180	9	92	20

* Before and After dewatering lock.
Dash (--) indicates data not recorded.

TABLE C-8. Physical-Chemical measurements, Tributary Stations, Middle Black Warrior-Tombigbee Rivers, July 29 - August 1, 1979.

Station Number	Date	Time	Total Depth ft	Stream Velocity ft/sec	Depth Sampled ft	pH S.U.	Temp. °C	Dissolved Oxygen mg/l	Oxidation Reduction Potential mV	Specific Conductance µmhos/cm	Turbidity Hach FTU	Air Temp °F	Cloud Cover %
T-1	7/29	1425	3	1	1.5	6.7	27.5	6.6	430	110	19	80	100
T-2	7/29	1435	1	1	0.5	6.6	25.5	7.6	410	40	110	80	100
T-3	7/29	1510	3	2	1	6.5	24.0	7.7	460	50	36	78	100
T-4	7/29	1700	3	1	1.5	6.1	25.5	7.8	490	40	18	84	70
T-5	8/1	1530	10	nil	5	6.8	29.0	6.8	470	160	5	92	40
T-6	8/1	1400	14	nil	5	6.7	29.0	7.8	480	150	4	90	40
T-7	8/1	0945	12	nil	5	7.0	29.0	8.7	450	80	5	90	0
T-8	8/1	1215	4	nil	2	7.1	29.0	7.8	460	170	8	90	10
T-9	7/31	1430	19	nil	5	7.7	29.5	6.3	420	200	5	95	20
T-10	7/31	1210	9	nil	4.5	8.5	31.0	11.3	370	200	6	92	60
T-11	7/30	1035	15	nil	5	7.5	27.0	6.3	380	170	70	90	20
T-12	7/30	1530	15	nil	5	8.0	28.5	9.5	380	170	8	93	10
D-1	7/29	1320	N/A	nil	5	6.5	27.5	8.0	460	650	8	92	50
D-2	7/31	1330	13	nil	5	7.1	36.0	8.1	430	150	7	93	50
D-3	7/31	1320	13	0.5	1	6.5	33.0	7.1	430	450	2	93	50
D-4	7/30	1210	0.2	1	0.1	7.0	30.5	7.3	380	130	21	90	30
D-5	7/30	1646	5	nil	2.5	8.8	31.0	13.2	320	160	11	94	20
D-6	7/31	0930	1	1.5	0.5	7.7	33.0	6.4	390	1300	12	89	0
R-11 Bef*	8/1	1320	--	--	5	6.8	29.0	7.3	470	150	12	--	--
R-12 Aft*	8/1	1320	--	--	5	6.8	29.0	7.3	470	150	14	--	--

* Before and After dewatering lock.
Dash (---) indicates data not recorded.

TABLE C-9 . Physical-Chemical measurements, Tributary Stations, Middle Black Warrior-Tombigbee Rivers, August 26 - 29, 1979.

Station Number	Date	Time	Total Depth ft	Stream Velocity ft/sec	Depth Sampled ft	pH S.U.	Temp. °C	Dissolved Oxygen mg/l	Oxidation Reduction Potential mV	Specific Conductance µmhos/cm	Turbidity Hach FTU	Air Temp °F	Cloud Cover %
T-1	8/26	1410	4	0.1	2	7.2	26.0	6.7	440	110	14	85	95
T-2	8/26	1415	1	0.1	0.5	7.4	25.0	7.7	440	70	13	86	95
T-3	8/26	1435	1	1	0.75	7.4	28.5	7.7	420	80	14	85	90
T-4	8/26	1625	1.5	0.3	0.75	6.5	24.0	5.9	490	40	16	80	80
T-5	8/29	1015	13	nil	5	6.7	26.5	6.7	560	50	7	85	10
T-6	8/29	1145	12	nil	5	8.4	29.0	10.4	480	180	5	90	25
T-7	8/29	1300	25	nil	5	8.1	29.5	9.1	460	180	4	88	35
T-8	8/29	1540	2	nil	1	7.3	32.0	7.8	480	320	7	88	25
T-9	8/28	1610	11	nil	5	8.2	29.0	6.5	410	170	7	85	40
T-10	8/28	1350	10	nil	5	9.0	28.0	9.7	360	190	12	90	50
T-11	8/27	0905	13	0.1	5	7.9	26.0	6.4	430	120	42	77	100
T-12	8/27	1550	16	nil	5	8.0	28.5	6.2	340	160	8	92	20
D-1	8/26	1305	2	1	1	7.2	28.0	7.5	460	1100	12	84	67
D-2	8/28	1510	12	0.5	5	7.3	36.0	7.7	460	160	8	83	67
D-3	8/28	1500	1.5	0.5	0.75	7.0	31.0	7.4	470	450	6	83	67
D-4	8/27	1215	0.5	0.5	0.25	7.3	28.5	6.6	350	130	12	85	30
D-5	8/27	1920	8	nil	4	7.5	29.0	5.5	430	150	8	80	20
D-6	8/28	0910	1	1.5	0.5	7.9	32.5	5.1	370	1200	6	81	20
R-11 B*	8/29	1700	14	nil	1.6	7.5	29.5	8.5	520	180	8	92	25

* Before dewatering lock. R-11 A was not sampled because the lock was inoperative.

TABLE C-10. Physical-Chemical measurements, Tributary Stations, Middle Black Warrior-Tombigbee Rivers, October 1 - 3, 1979.

Station Number	Date	Time	Total Depth ft	Stream Velocity ft/sec	Depth Sampled ft	pH S.U.	Temp. °C	Dissolved Oxygen mg/l	Oxidation Reduction Potential mV	Specific Conductance µmhos/cm	Turbidity Hach FTU	Air Temp °F	Cloud Cover %
T-1	10/1	1155	6	<0.1	3	7.0	21.5	5.4	450	100	13	81	0
T-2	10/1	1205	3	<0.1	1.5	7.2	22.0	8.4	450	140	6	81	10
T-3	10/1	1220	6	0.5	3	7.4	20.0	8.0	450	70	9	82	20
T-4	10/1	1345	5	0.5	2.5	6.6	21.5	4.0	470	50	12	85	20
T-5	10/1	1430	7	nil	3.5	6.9	23.0	7.1	460	70	7	85	10
T-6	10/1	1550	12	nil	5	7.8	23.5	10.6	430	130	7	84	10
T-7	10/1	1630	15	nil	5	7.5	24.0	8.3	430	200	5	86	10
T-8	10/2	1035	6	nil	3	7.5	23.0	5.5	450	250	14	76	0
T-9	10/2	1320	18	nil	5	8.0	24.5	6.6	420	260	10	77	0
T-10	10/2	1450	14	nil	5	8.3	24.5	7.1	410	300	10	79	0
T-11	10/3	1640	15	0.3	5	7.8	21.5	7.4	440	170	20	81	0
T-12	10/3	0930	15	nil	5	7.4	22.5	5.8	440	160	12	63	0
D-1	10/1	1112	20	2	5	7.4	23.5	7.4	450	300	7	80	0
D-2	10/2	1400	13	0.1	5	7.2	27.5	7.7	450	205	15	78	0
D-3	10/2	1410	4	0.5	2	5.1	25.0	8.6	460	480	7	78	0
D-4	10/3	1450	0.2	3	0.1**	7.4	27.0	9.4	350	·105	58	80	0
D-5	10/3	1045	miss	nil	5	7.2	22.0	6.1	460	120	25	miss	0
D-6	10/2	1805	3	0.5	1.5	8.0	27.0	9.0	420	1900	12	77	0
11 Aft*	10/2	0930	17	--	5	7.2	23.5	7.6	450	190	22	72	0
11 Bef*	10/2	1045	16	--	5	7.2	23.5	8.3	460	200	15	74	0
B-8	10/3	0920	40	<0.1	5	7.1	22.0	5.6	160	120	21	63	0

* Before and After dewatering lock.
** Hole was dug in bottom of stream for base of Hydrolab.

APPENDIX D

TOP AND BOTTOM COMPARISON OF IN-SITU PARAMETERS

TABLE D-1. Top and bottom comparison of in-situ parameters, Middle Black Warrior-Tombigbee Rivers, October 1 - 5, 1978.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/ℓ	OXIDATION REDUCTION POTENTIAL mV
1	10/2	0.3	23	7.2	185	7.4	310
		3	24	7.3	180	7.5	320
		6	24	7.2	180	7.4	315
2	10/2	0.3	22.5	7.2	185	7.4	315
		2	24	7.2	185	7.2	325
		4	23.5	7.2	185	7.2	320
3	10/2	0.3	24.5	7.4	195	8.6	340
		4	25	7.4	195	8.2	345
		6	25	7.4	195	8.2	340
4	10/2	0.3	24.5	7.3	215	8.1	325
		2	25	7.3	215	7.7	330
		4.5	25	7.2	210	7.5	330
5	10/2	0.3	25.5	8.8	200	11.6	285
		2	25.5	7.9	200	9.5	330
		3	25.5	7.7	200	9.2	330
		5.5	25.5	7.5	200	8.6	325
6	10/2	0.3	25	8.4	195	9.9	315
		2	26	7.7	195	8.7	340
		3	26	7.5	195	8.2	345
		4	26	7.4	195	7.4	350
		6.5	26	7.2	195	7.1	350
		9	26	7.2	195	6.9	345
		10.5	26	7.2	195	6.7	340

TABLE D-1 . Continued.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/ℓ	OXIDATION REDUCTION POTENTIAL mV
7	10/3	0.3	26	7.2	200	6.7	365
		2.5	26	7.2	200	6.5	365
		4.5	26	7.1	200	6.4	365
		6	26	7.1	200	6.4	365
		7.5	25.5	7.1	200	6.2	365
		9.5	25.5	7.0	195	5.7	365
8	10/3	0.3	25	7.3	195	6.8	345
		2	25	7.2	195	6.3	350
		4	25	7.1	195	6.1	350
		6	25	7.0	190	5.7	350
		8	25	7.0	190	5.6	350
		10	25	7.0	190	5.9	345
9	10/3	0.3	25.5	7.2	195	7.0	355
		2	25.5	7.2	195	6.4	355
		4	25	7.1	195	6.1	355
		6	25	7.1	195	6.1	355
		7.5	24	7.1	195	6.2	350
10	10/3	0.3	26.5	7.3	195	7.9	350
		3	26	7.3	195	7.8	360
		5	26	7.3	195	7.7	360
		7.5	26	7.2	195	7.6	360
12	10/3	0.3	26.5	7.6	195	8.3	345
		3	26.5	7.4	195	7.6	360
		5	26.5	7.3	195	7.3	360
		7	26.5	7.2	195	7.2	355
		9	26.5	7.2	195	7.1	350

TABLE D-1. Continued.

STATION	DATE	DEPTH meters	TEMP °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/ℓ	OXIDATION REDUCTION POTENTIAL mV
13	10/4	0.3	28	7.6	180	7.7	345
		2	27	7.5	180	7.7	360
		4	27	7.3	180	7.1	370
		6	27	7.3	180	7.1	365
		8	27	7.3	180	7.1	365
		10	27	7.3	180	7.0	360
14	10/4	0.3	25	7.6	185	8.3	345
		2	27	7.5	185	7.6	320
		4	27	7.3	180	6.8	320
		6	27	7.3	180	6.6	320
		8	27	7.3	180	6.4	310
		10	27	7.3	180	6.4	300
15	10/4	0.3	28	7.7	190	8.0	315
		2	26	7.7	185	7.8	335
		4	26	7.3	180	6.6	350
		6	26	7.3	180	6.8	345
		8	27.5	7.3	190	6.6	350
		10	28	7.3	190	6.6	340
		12	28	7.3	185	6.6	340
16	10/4	0.3	27	7.7	200	7.7	325
		2	27	7.5	200	7.0	315
		3	27	7.4	200	6.6	310
		5	27	7.3	200	6.4	310
		7	27	7.3	200	6.4	310
		9	27	7.3	200	6.2	300
		11	26.5	7.3	200	6.2	295
		13	26.5	7.2	200	6.2	280

TABLE D-1. Continued.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/ℓ	OXIDATION REDUCTION POTENTIAL mV
17	10/1	0.3	25	7.8	165	7.8	310
		4	25.5	7.7	160	7.3	310
18	10/1	0.3	23	7.9	170	6.6	290
19	10/1	0.3	25	7.7	170	5.2	310
		5	25.5	7.6	170	4.4	315
20	10/5	0.3	26	7.3	175	5.2	365
		2	26	7.2	175	5.3	370
		4	26	7.2	175	5.2	370
		6	26	7.2	175	5.2	370
		8	26	7.2	175	5.2	370
		10	26	7.2	175	5.2	370
21		0.3	26	7.6	190	6.3	350
		2	26	7.4	190	5.6	360
		4	26	7.4	190	5.5	360
	10/5	6	26	7.3	190	5.5	360
		8	25.5	7.3	190	5.5	360
		10	25.5	7.3	190	5.5	360
		12	25	7.3	190	5.6	360
		14	25	7.3	190	5.6	360

TABLE D-1. Continued.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/ℓ	OXIDATION REDUCTION POTENTIAL mV
22	10/5	0.3	26	7.4	200	7.0	365
		1	26	7.4	200	7.3	355
		3	26	7.2	200	6.4	370
		5	27	7.2	200	6.0	380
		7	27	7.2	200	5.8	380
		9	27	7.1	200	5.8	380
		11	27	7.1	200	5.5	385
		13	27	7.0	200	5.7	385
		15	27	7.0	200	5.6	385
23	10/4	0.3	27	7.6	190	7.3	345
		2	27	7.8	190	7.1	330
		3	27	7.3	190	5.9	330
		5	27	7.3	190	5.7	330
		7	27	7.2	190	5.5	330
		9	27	7.2	190	5.4	325
		11	27	7.2	190	5.4	325
		12.5	27	7.2	190	5.3	320

TABLE D-2. Top and bottom comparison of in-situ parameters, Middle Black Warrior-Tombigbee Rivers, December 10 - 14, 1978.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/ℓ	OXIDATION REDUCTION POTENTIAL mV
1	12/11	0.3	10.0	7.4	200	*	310
		7	13.0	7.4	195	*	310
2	12/11	0.3	11.5	7.6	200	*	320
		6	12.0	7.5	200	*	320
3	12/12	0.3	11.0	7.4	200	10.9	330
		7	11.0	7.4	200	10.4	330
4	12/12	0.3	11.0	7.4	205	10.6	320
		5	11.0	7.5	200	10.4	320
5	12/12	0.3	10.5	7.5	190	10.9	320
		7	10.5	7.3	190	10.6	320
6	12/12	0.3	12.5	7.4	170	11.0	230
		12	12.5	7.3	175	9.7	230
7	12/12	0.3	12.5	7.3	165	9.8	310
		9	12.5	7.3	165	9.8	315
8	12/12	0.3	12.0	7.2	170	9.5	310
		13	12.0	7.1	170	9.4	310
9	12/13	0.3	9.5	7.0	170	10.0	360
		8	9.5	6.7	165	9.6	350
10	12/13	0.3	12.0	8.8	170	11.4	300
		8	12.0	8.8	170	11.4	310

* Instrument malfunction.

TABLE D-2. Continued.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/ℓ	OXIDATION REDUCTION POTENTIAL mV
12	12/13	0.3	10.5	*	170	10.9	330
		11	11.0	*	170	10.3	335
13	12/13	0.3	12.0	*	160	10.2	340
		12	12.0	*	160	10.1	345
14	12/13	0.3	14.5	*	160	10.4	290
		12	14.5	*	165	9.8	305
15	12/13	0.3	13.0	*	165	10.2	290
		14	13.0	*	165	10.0	290
16	12/14	0.3	12.5	*	165	10.3	310
		15	12.5	*	165	9.8	320
17	12/10	0.3	7.5	7.1	115	11.0	270
		5	7.5	7.2	115	11.0	270
18	12/10	0.3	7.5	7.1	*	11.0	270
		5	7.5	7.2	*	11.0	270
19	12/10	0.3	*	*	*	*	*
		7	*	*	*	*	*
20	12/10	0.3	9.0	*	*	*	*
		14	*	*	*	*	*
21	12/14	0.3	10.0	*	130	9.6	290
		14	9.5	*	130	9.4	300
22	12/14	0.3	10.5	*	140	9.8	270
		16	10.5	*	140	9.6	260
23	12/14	0.3	9.0	*	140	10.4	330
		13	8.5	*	140	9.8	330

* Instrument malfunction.

TABLE D-3. Top and bottom comparison of in-situ parameters, Middle Black Warrior-Tombigbee Rivers, February 27 - March 2, 1979.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV
1	3/1/79	1	10.0	6.2	155	11.5	450
		12	10.0	6.2	155	11.5	450
2	3/1/79	1	10.0	6.5	155	11.5	430
		10	10.0	6.5	155	11.4	430
3	3/1/79	1	11.0	7.1	160	11.4	400
		10	11.0	7.1	160	11.4	400
4	2/29/79	1	11.0	7.2	160	11.3	390
		7	11.0	7.2	160	11.3	390
5	2/28/79	1	10.0	6.9	140	11.6	420
		12	10.0	6.8	145	11.6	415
6	2/28/79	1	10.0	6.9	140	11.1	410
		14	10.0	6.7	140	11.2	410

TABLE D-3. Continued.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV
7	2/28/79	1	9.5	6.8	140	11.2	410
		12	9.5	6.8	140	11.2	420
9	2/28/79	1	9.5	6.7	135	11.1	420
		8.5	9.5	6.7	135	11.2	420
10	2/26/79	1	7.5	6.7	150	11.8	440
		14	7.5	6.7	150	11.8	440
12	2/26/79	1	9.0	6.8	150	11.6	410
		15	9.0	6.8	150	11.4	410
13	2/26/79	1	8.5	6.8	150	11.0	420
		16	9.0	6.8	150	11.1	420
14	2/26/79	1	9.5	6.9	150	11.0	410
		19	9.5	6.8	160	11.0	410

TABLE D-3. Continued.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV
15	2/26/79	1	9.5	6.9	160	11.2	390
		19	9.0	6.9	160	11.2	390
16	2/26/79	1	Miss	6.9	155	11.0	390
		20	Miss	7.0	155	11.0	380
17	2/27/79	1	10.5	7.5	110	9.8	400
		12	10.5	7.4	110	9.5	410
18	2/27/79	1	10.5	7.5	110	9.4	390
		14	10.5	7.5	110	9.4	390
19	2/27/79	1	12.5	7.6	110	9.2	380
		12	12.5	7.5	110	9.2	390
20	2/27/79	1	12.0	7.7	120	9.2	375
		16	12.0	7.6	120	9.2	370
21	2/27/79	1	13.0	7.6	120	9.2	370
		18	13.0	7.6	120	9.1	370
23	2/27/79	1	10.5	7.2	130	10.1	400
		19	10.5	7.1	130	10.1	400

TABLE D-4. Top and bottom comparison of in-situ parameters, Middle Black Warrior-Tombigbee Rivers, May 13-16, 1979.

STATION	DATE	SAMPLE DEPTH METERS	TEMP. °C	D.O. mg/ℓ	COND. μmho/cm	pH S.U.	ORP mV
1	5/14/79	1.5	19.5	9.6	120	6.9	400
		7.3	19.0	9.4	120	6.9	400
2	5/14/79	1.5	19.5	9.6	125	6.9	420
		4.9	19.5	9.6	125	6.9	420
3	5/14/79	1.5	19.5	9.1	135	6.9	410
		7.5	19.5	9.2	135	6.9	410
4	5/14/79	1.5	19.5	9.1	135	6.9	410
		5.5	19.5	9.1	135	6.8	420
5	5/14/79	1.5	20.0	9.1	130	6.9	410
		14.8	20.0	9.2	130	6.8	420
6	5/15/79	1.5	20.0	8.7	120	6.7	410
		9.8	20.0	8.8	120	6.8	410
7	5/15/79	1.5	21.0	8.8	135	6.8	410
		9.5	20.5	8.8	135	6.8	420

TABLE D-4. CONTINUED.

STATION	DATE	SAMPLE DEPTH METERS	TEMP. °C	D.O. mg/ℓ	COND. μmho/cm	pH S.U.	ORP mV
9	5/15/79	1.5	21.0	8.4	135	6.8	425
		8.0	21.0	8.5	135	6.8	430
10	5/15/79	1.5	21.0	9.3	140	6.8	430
		7.0	21.0	9.4	140	6.8	435
12	5/16/79	1.5	21.0	8.9	35	6.9	420
		9.0	21.0	9.2	135	6.7	430
13	5/16/79	1.5	22.0	8.8	140	6.8	410
		9.0	22.0	8.9	140	6.8	420
14	5/16/79	1.5	22.5	8.8	140	6.8	410
		11.5	22.0	8.8	140	6.8	420
15	5/16/79	1.5	22.5	8.8	140	6.8	410
		14.0	22.0	8.5	140	6.8	420
16	5/16/79	1.5	22.0	9.1	145	6.9	390
		13.0	22.0	9.1	145	6.9	400

TABLE D-4. CONTINUED.

STATION	DATE	SAMPLE DEPTH METERS	TEMP. °C	D.O. mg/ℓ	COND. µmho/cm	pH S.U.	ORP mV
17	5/13/79	1.5	21.5	7.9	100	6.8	420
		5.0	-	-	-	-	-
18	5/13/79	1.5	21.0	7.8	100	7.4	390
		22.0	21.0	7.8	100	7.4	400
19	5/13/79	1.5	21.0	7.2	100	8.2	350
		9.0	21.0	7.3	100	8.2	350
20	5/13/79	1.5	21.0	7.2	100	7.2	350
		13.5	21.0	7.2	100	7.2	350
21	5/13/79	1.5	21.5	7.3	110	7.9	370
		13.5	21.5	7.3	-	-	-
23	5/16/79	1.5	22.0	7.7	135	7.1	390
		15.0	22.0	7.7	135	7.1	390

Dash (-) indicates measurement not taken.

TABLE D-5. Top and bottom comparison of in-situ parameters, Middle Black Warrior-Tombigbee Rivers, June 17 - 20, 1979.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. μmhos/cm	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV
1	6/19/79	1.5	25.0	6.9	205	7.4	420
		6.0	25.0	6.9	205	7.4	420
2	6/19/79	1.5	25.5	7.0	205	7.9	400
		3.6	25.5	7.0	205	7.9	400
3	6/19/79	1.5	26.5	6.9	205	7.8	400
		7.0	26.0	6.8	205	7.6	410
4	6/19/79	1.5	26.5	6.9	210	7.8	405
		4.3	26.0	6.8	210	7.5	410
5	6/19/79	1.5	27.5	7.1	190	9.3	390
		7.0	26.5	7.0	190	8.6	390
6	6/20	1.5	27.0	7.1	190	8.3	410
		9.8	27.0	6.9	190	8.1	420

TABLE D-5. Continued.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. umhos/cm	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV
7	6/20/79	1.5	27.0	7.1	185	8.0	410
		9.5	27.0	7.0	185	7.8	420
9	6/20/79	1.5	27.5	7.0	180	8.1	440
		6.0	27.0	6.9	180	7.2	440
10	6/20/79	1.5	27.5	7.1	180	8.2	430
		7.5	27.0	7.0	180	8.0	430
12	6/18/79	1.5	27.5	7.4	170	9.0	380
		10.6	26.0	7.0	170	7.7	390
13	6/18/79	1.5	27.5	7.2	165	8.4	380
		8.5	27.0	7.0	165	7.7	380
14	6/18/79	1.5	29.0	7.2	170	8.3	380
		10.6	27.0	7.1	170	7.6	380

TABLE D-5. Continued.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV
15	6/18/79	1.5	28.0	7.2	160	8.3	380
		13.6	27.0	7.0	160	7.2	380
16	6/18/79	1.5	27.5	7.2	160	7.8	380
		11.8	27.0	7.0	160	7.3	380
17	6/17/79	1.6	25.0	7.1	120	7.8	390
		4.0	Miss	7.2	120	7.8	390
18	6/17/79	1.5	25.5	7.4	120	7.1	370
		4.0	25.5	7.4	120	7.1	380
19	6/17/79	1.5	27.0	7.5	120	5.4	350
		6.1	27.0	7.4	120	5.2	350
20	6/17/79	1.5	28.0	8.0	130	10	330
		12.2	26.0	7.2	130	9	370
21	6/17/79	1.5	26.5	7.3	125	8.7	380
		14	25.5	7.0	120	6.8	390
23	6/18/79	1.5	27.0	7.1	158	9.4	365
		15.2	26.5	6.9	140	8.4	370

TABLE D-6. Top and bottom comparison of in-situ parameters, Middle Black Warrior-Tombigbee Rivers, July 29 - August 1, 1979.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV
1	7/29/79	1.5	27.5	7.0	190	7.6	440
		6.5	27.5	7.0	190	7.5	440
2	7/29/79	1.5	27.0	6.9	190	7.7	440
		6.5	27.0	6.9	190	7.7	440
3	7/29/79	1.5	27.5	6.9	180	8.0	460
		6.5	27.5	6.9	180	7.9	460
4	7/29/79	1.5	28.0	6.9	180	8.1	460
		4.5	28.0	6.8	180	8.1	460
5	7/29/79	1.5	28.0	6.9	170	8.3	460
		4.5	27.5	6.8	170	7.9	460
6	8/1/79	1.5	29.0	6.8	160	8.0	480
		10.5	29.0	6.8	160	8.0	480

TABLE D-6. Continued.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV
7	8/1/79	1.5	29.0	6.7	150	7.4	480
		Miss	28.5	6.7	150	7.3	480
9	8/1/79	1.5	28.5	6.7	140	9.1	480
		7.5	28.0	6.7	140	6.9	480
10	8/1/79	1.5	29.0	6.8	150	8.0	470
		8.5	28.5	6.8	150	7.8	470
12	7/31/79	1.5	29.0	7.0	150	8.4	460
		Miss	28.5	6.9	150	8.1	460
13	7/31/79	1.5	29.0	7.0	150	8.1	470
		6.0	28.5	6.9	150	8.1	470
14	7/31/79	1.5	29.0	7.0	150	8.2	470
		9.5	28.5		150	7.6	470

TABLE D-6. Continued.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV
15	7/31/79	1.5	29.5	7.0	160	8.1	470
		14	28.5	6.8	160	7.6	480
16	7/31/79	1.5	29.5	7.0	160	7.6	470
		9.5	29.0	6.9	160	7.4	470
17	7/30/79	1.5	27.5	7.1	110	8.0	460
		3.0	27.0	7.1	110	8.0	460
18	7/30/79	1.5	27.5	7.1	120	7.6	420
		4.0	27.5	7.1	120	7.5	420
19	7/30/79	1.5	27.5	7.1	120	7.7	460
		8.5	27.5	7.0	120	7.4	460
20	7/30/79	1.5	28.5	7.1	140	7.3	MISS
		12	28.0	7.0	140	6.8	MISS
21	7/30/79	1.5	29.0	7.2	150	8.2	460
		13	27.5	7.0	150	6.1	460
23	7/31/79	1.5	28.5	7.0	150	7.0	470
		13	28.0	6.9	150	6.3	470

TABLE D-7. Top and bottom comparison of in-situ parameters, Middle Black Warrior-Tombigbee Rivers, October 1 - 3, 1979.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV
1	10/1/79	1.6	23.5	6.9	200	8.8	480
		8.0	23.5	6.9	200	8.8	480
2	10/1/79	1.6	23.5	7.3	200	8.6	440
		6.0	23.5	7.3	200	8.6	440
3	10/1/79	1.6	23.5	7.4	200	8.4	440
		6.0	23.5	7.4	200	8.3	440
4	10/1/79	1.6	23.5	7.4	210	8.3	450
		7.0	23.5	7.4	210	8.3	450
5	10/1/79	1.6	23.5	7.4	210	8.3	450
		9.0	23.5	7.4	210	8.3	450
6	10/1/79	1.6	24.0	7.4	210	8.2	470
		8.0	24.0	7.3	210	8.2	470

TABLE D-7. Continued

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. umhos/cm	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV
7	10/1/79	1.6	24.0	7.4	215	8.2	460
		11.0	24.0	7.3	215	8.1	460
9	10/1/79	1.6	24.0	7.4	215	7.8	450
		6.0	24.0	7.3	215	7.8	450
10	10/2/79	1.6	24.0	7.3	215	8.8	450
		8.5	24.0	7.2	215	8.8	460
12	10/2/79	1.6	24.0	7.2	215	8.1	460
		10.5	24.0	7.2	215	8.1	460
13	10/2/79	1.6	24.0	7.2	210	7.9	470
		9.0	24.0	7.2	210	7.9	470
14	10/2/79	1.6	24.0	7.2	200	8.0	460
		10.5	24.0	7.2	200	8.0	460

TABLE D-7. Continued.

STATION	DATE	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV
15	10/2/79	1.6	24.0	7.2	190	8.1	460
		13.5	24.0	7.1	190	7.9	460
16	10/2/79	1.6	24.0	7.3	180	7.8	460
		14.0	24.0	7.2	180	7.8	460
17	10/3/79	4.0	22.0	7.0	85	9.5	480
		16.0	22.0	7.0	85	9.5	480
18	10/3/79	4.0	22.5	7.1	90	9.1	480
		16.0	22.5	7.1	90	9.1	480
19	10/3/79	1.6	22.0	7.1	90	8.3	480
		6.0	22.0	7.1	90	7.9	480
20	10/3/79	1.6	22.5	7.1	110	5.9	460
		12.0	22.0	7.1	110	5.8	470
21	10/3/79	1.6	22.0	7.1	100	5.4	480
		14.0	22.0	7.1	100	5.4	480
23	10/2/79	1.6	23.5	7.2	160	7.4	470
		16.0	23.0	7.1	140	6.6	470

APPENDIX E

CROSS-SECTION STATIONS R-8 AND R-22

TABLE E-1. In-situ parameters measured at vertical cross-section, Station R-8, Middle Black Warrior-Tombigbee Rivers, July 30 - August 4, 1978.

% DISTANCE RIGHT BANK	SAMPLE DEPTH meters	pH S.U.	TEMPERATURE °C	DISSOLVED OXYGEN mg/l	OXIDATION REDUCTION POTENTIAL mV	SPECIFIC CONDUCTANCE µmhos/cm
10	1	7.6	30.5	6.6	355	185
	2	7.6	31.0	6.6	360	185
	3	7.5	31.0	6.2	360	180
40	1	8.1	30.0	7.0	330	180
	2	7.8	31.0	6.9	350	185
	3	7.8	31.0	6.9	350	180
	5	7.6	31.0	6.3	360	180
	7	7.5	31.0	6.0	370	180
75	1	7.9	30.5	7.2	350	185
	2	7.6	30.5	6.5	360	185
	4	7.6	31.0	6.2	365	180
	6	7.5	31.0	6.1	365	185
	8	7.4	31.0	5.8	370	185
	10	7.4	31.0	5.1	375	180
	12	7.3	31.0	4.9	380	175
95	1	7.9	31.0	7.1	340	180
	3	7.9	31.0	7.1	340	180
	5	7.6	31.5	6.2	355	180
	7	7.5	31.0	5.9	360	180
	9	7.4	31.0	5.3	370	180
	11	7.4	31.0	5.1	370	180
	13	7.3	31.0	4.8	375	175
	15	7.3	30.5	4.8	375	175

TABLE E-2 . In-situ parameters measured at vertical cross-section, Station R-22, Middle Black Warrior-Tombigbee Rivers, July 30 - August 4, 1978.

% DISTANCE RIGHT BANK	SAMPLE DEPTH meters	TEMP. °C	D.O. mg/l	COND. μmhos/cm	pH S.U.	ORP mV
5	1	32.0	9.8	185	8.5	300
25	1	31.0	8.7	180	7.7	340
	2	31.0	8.2	180	7.6	350
	3	31.0	8.2	180	7.6	350
	5	31.0	7.6	180	7.4	360
	7	31.0	7.6	180	7.3	320
60	1	29.0	8.5	190	7.5	340
	2	29.5	8.0	195	7.5	340
	3	30.0	7.5	190	7.4	350
	4	30.0	7.5	195	7.4	350
	5	30.0	7.4	195	7.3	360
	6	30.0	7.4	195	7.3	360
	7	30.0	7.2	190	7.2	360
	8	30.5	7.1	190	7.2	370
	9	30.5	7.3	195	7.2	370
	10	30.5	7.2	195	7.2	370
	12	30.5	7.0	195	7.2	370
90	1	30.0	8.4	180	7.6	350
	2	30.0	7.7	180	7.5	350
	4	30.0	7.5	180	7.4	360
	6	30.5	7.3	180	7.3	360
	8	30.5	6.8	190	7.2	370

TABLE E-3 . In-situ parameters measured at vertical cross-section, Station R-8, Middle Black Warrior-Tombigbee Rivers, August 27 - 31, 1978.

% DISTANCE RIGHT BANK	SAMPLE DEPTH (meters)	pH S.U.	TEMP. °C	DISSOLVED OXYGEN mg/l	ORP mV	SP. COND. µmhos/cm
20	0.5	7.1	28.0	6.9	290	160
40	1	7.1	27.0	7.2	340	170
	2	7.1	29.0	8.0	325	170
85	1	7.1	28.5	6.5	330	160
	2	7.1	29.0	6.3	330	160
	3	7.1	29.5	6.3	330	160
	14	7.1	27.0	5.6	300	160
97	1	7.0	27.5	6.7	340	160
	6	7.0	28.5	6.4	340	160

TABLE E-4. In-situ parameters measured at vertical cross-section, Station R-22, Middle Black Warrior-Tombigbee Rivers, August 27 - 31, 1978

% DISTANCE RIGHT BANK	SAMPLE DEPTH meters	TEMP. °C	D.O. mg/l	COND. µmhos/cm	pH S.U.	ORP mV
5	1	29.0	7.7	170	7.7	300
	2	29.5	6.7	180	7.4	315
16	1	28.5	6.9	155	7.4	295
	4	30.0	6.1	180	7.2	320
	6	30.0	7.6	175	7.1	315
	8	29.0	5.5	180	7.2	310
60	1	30.0	6.7	180	7.4	310
	2	30.5	6.5	180	7.2	320
	4	30.5	5.6	180	7.1	325
	7	30.5	5.3	180	7.1	320
	10	30.5	4.6	175	7.0	320
	13	30.5	4.2	175	7.0	310
	15	30.0	4.2	175	7.0	310
80	1	29.5	6.6	180	7.4	315
	3.5	30.5	6.4	180	7.3	320
	7.5	30.5	6.3	180	7.3	320

TABLE E-5 . In-situ parameters measured at vertical cross-section, Station R-8, Middle Black Warrior-Tombigbee Rivers, October 1 - 5, 1978.

% DISTANCE RIGHT BANK	DEPTH meters	TEMP. ^{0}C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/ℓ	OXIDATION REDUCTION POTENTIAL mV
80	1	26	7.2	195	7.0	350
	2	26	7.2	195	6.4	355
	8	26	7.1	195	6.1	355
	10	26	7.1	190	6.0	355
	12.5	26	7.0	190	5.9	355
95	0.3	25	7.3	195	6.8	345
	2	25	7.2	195	6.3	350
	4	25	7.1	195	6.1	350
	10	25	7.0	190	5.9	345
67	3	25.5	7.1	195	6.2	335
	5	25.5	7.1	195	6.2	330
	7	25.5	7.1	195	6.2	330
	9	25.5	7.1	195	6.1	330
	11	25	7.1	195	6.0	325
	12.5	25	7.1	195	5.9	320

TABLE E-6. In-situ parameters measured at vertical cross-section, Station R-22, Middle Black Warrior-Tombigbee Rivers, October 1 - 5, 1978.

% DISTANCE RIGHT BANK	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. µmhos/cm	DISSOLVED OXYGEN mg/ℓ	OXIDATION REDUCTION POTENTIAL mV
50	0.3	27	7.6	200	7.5	360
	1	27	7.6	200	7.7	360
	3	27	7.2	200	6.3	370
	5	27	7.1	200	6.1	370
	7	27	7.1	200	5.8	370
	14.5	27	7.0	200	5.6	370
75	1	25	7.5	200	7.2	355
	2	26	7.4	200	6.9	360
	3	26	7.3	200	6.2	365
	5	26	7.2	200	6.0	370
	7.5	26	7.2	200	5.9	380
90	1	26	7.4	200	7.3	355
	3	26	7.2	200	6.4	370
	5	27	7.2	200	6.0	380
	9	27	7.1	200	5.8	380
	11	27	7.1	200	5.5	385
	13	27	7.0	200	5.7	385

TABLE E-7 . In-situ parameters measured at vertical cross-section, Station R-8, Middle Black Warrior-Tombigbee Rivers, December 10 - 14, 1978.

% DISTANCE RIGHT BANK	SAMPLE DEPTH (METERS)	TEMP. °C	D.O. mg/l	COND. µmhos/cm	pH S.U.	ORP mV
25	1	12.5	9.8	170	7.4	320
	2	12.5	9.8	170	7.4	320
67	1	12.5	9.5	170	7.4	320
	3	12.5	9.5	170	7.4	320
80	1	12.0	9.4	170	7.2	310
	5	12.0	9.4	170	7.2	310
	13	12.0	9.4	170	7.1	310
95	1	12.5	9.5	170	7.0	320
	5	12.5	9.5	170	7.0	320
	3	12.5	9.6	170	7.0	320

TABLE E-8. In-situ parameters measured at vertical cross-section, Station R-1 Middle Black Warrior-Tombigbee Rivers, December 10 - 14, 1978.

% DISTANCE RIGHT BANK	DEPTH meters	TEMP. °C	pH S.U.	SP. COND. μmhos/cm	DISSOLVED OXYGEN mg/ℓ	OXIDATION REDUCTION POTENTIAL mV
10	1	10	*	140	9.9	330
	3	10	*	140	9.8	330
	5	9.5	*	140	9.7	340
30	1	10.5	*	140	9.7	280
	3	10.5	*	140	9.7	280
	5	10.5	*	140	9.8	280
	11	10.5	*	140	9.8	280
60	1	10.5	*	140	9.8	270
	5	10.5	*	140	9.8	270
	10	10.5	*	140	9.7	270
	15	10.5	*	140	9.7	260
	17	10.5	*	140	9.6	260
90	1	10.0	*	140	9.9	295
	3	10.0	*	140	9.9	295
	5	10.0	*	140	9.9	295
	11	10.0	*	140	9.8	295

* Instrument malfunction.

TABLE E-9. In-situ parameters measured at vertical cross-section, Station R-8, *Middle Black Warrior-Tombigbee Rivers*, February 27 - March 2, 1979.

% FROM RIGHT BANK	DEPTH (meters)	TEMPERATURE ^{o}C	DISSOLVED OXYGEN mg/ℓ	pH S.U.	SP. COND. μmhos/cm	OXIDATION REDUCTION POTENTIAL mV
10	1	10.0	11.2	6.8	130	410
	2	9.5	11.0	6.8	130	410
60	1	10.0	11.0	6.8	140	420
	9	10.0	10.9	6.8	140	420
75	1	10.0	11.1	6.7	140	430
	15	10.0	11.1	6.7	140	420
95	1	10.0	11.0	6.8	140	420
	8	10.0	10.9	6.8	135	420

TABLE E-10 In-situ parameters measured at vertical cross-section, Station R-22, Middle Black Warrior-Tombigbee Rivers, February 27 - March 2, 1979.

% FROM RIGHT BANK	DEPTH (meters)	TEMPERATURE °C	DISSOLVED OXYGEN mg/ℓ	pH S.U.	SP. COND. µmhos/cm	OXIDATION REDUCTION POTENTIAL mV
15	1	*	11.0	7.0	140	410
15	8	*	11.0	6.8	145	410
30	1	*	10.3	7.1	140	400
30	10	*	10.4	7.1	140	390
67	1	*	9.8	7.1	130	400
67	22	*	9.8	7.3	130	390
95	1	*	9.5	7.4	120	400
95	7	*	9.6	7.4	120	400

* Instrument malfunction.

TABLE E-11. In-situ parameters measured at vertical cross-section, Station R-8, Middle Black Warrior-Tombigbee Rivers, May 13 - 16, 1979.

% DIST. RT. BANK	SAMPLE DEPTH (Meters)	TEMP. °C	D.O. mg/ℓ	COND. µmhos/cm	pH S.U.	ORP mV
10	1	21.5	8.8	130	6.9	410
	2	21.0	8.5	130	6.9	410
60	1	21.0	8.6	130	6.8	410
	5	20.5	8.6	130	6.8	420
80	1	21.0	8.3	130	6.8	420
	12	20.5	8.3	130	6.7	420
95	1	21.0	8.3	130	6.8	430
	8	21.0	8.5	130	6.8	430

TABLE E-12. In-situ parameters measured at vertical cross-section, Station R-22, Middle Black Warrior-Tombigbee Rivers, May 13 - 16, 1979.

% DIST. RT. BANK	SAMPLE DEPTH (Meters)	TEMP. °C	D.O. mg/ℓ	COND. µmhos/cm	pH S.U.	ORP mV
90	1	22.0	7.7	130	7.1	420
	3	22.0	7.6	130	7.2	420
67	1	22.0	7.7	130	7.2	420
	15	21.5	7.7	130	7.2	420
30	1	22.0	7.7	130	7.1	390
	9	22.0	7.8	130	7.1	390
10	1	22.0	7.9	140	7.1	400
	5.5	22.0	7.8	140	7.1	400

TABLE E-13. In-situ parameters measured at vertical cross-section, Station R-8, Middle Black Warrior-Tombigbee Rivers, June 17 - 20, 1979.

% DIST RT. BANK	SAMPLE DEPTH (Meters)	TEMP °C	D.O. mg/l	COND. µmhos/cm	pH S.U.	ORP mV
10	[illegible]	27	8.1	180	7.0	410
60	0.5	28.5	7.7	180	7.0	410
80	1.5	27.5	7.9	180	6.9	440
	3.0	27	7.5	180	6.8	440
	6.0	27	7.4	180	6.8	440
	11.5	27	7.3	180	6.8	440
95	1.5	28	7.8	180	6.9	450
	3.0	27	7.5	180	6.9	450
	5.0	27	7.4	180	6.9	450
	7.5	27	7.3	180	6.9	450

TABLE E-14. In-situ parameters measured at vertical cross-section, Station R-22, Middle Black Warrior-Tombigbee Rivers, June 17 - 20, 1979.

% DIST RT. BANK	SAMPLE DEPTH (Meters)	TEMP °C	D.O. mg/l	CONDITON µmhos/cm	pH S.U.	ORP mV
10	1	28	8.1	150	7.2	360
	7.2	27	6.9	150	7.1	370
50	1	27.5	7.8	150	7.2	360
	2.3	27	7.6	150	7.2	360
75	1	27.5	8.2	150	7.2	360
	5	27	7.4	150	7.1	360
	10	26.5	6.9	140	7.1	370
	15	26	6.4	130	7.0	380
95	1	27.5	7.6	150	7.2	360
	3	27	7.4	150	7.1	360

TABLE E-15. In-situ parameters measured at vertical cross-section, Station R-8, Middle Black Warrior-Tombigbee Rivers, July 29 - August 1, 1979.

% DIST. RT. BANK	SAMPLE DEPTH (Meters)	TEMP. °C	D.O. mg/ℓ	COND. µmhos/cm	pH S.U.	ORP mV
10	0.25	29.5	7.3	140	6.8	470
	1.5	29.0	7.2	140	6.7	470
67	0.25	28.5	7.0	140	6.7	470
	[illegible].5	28.5	7.0	140	6.6	470
80	1.5	28.5	7.0	140	6.7	460
	13.5	28.5	6.7	140	6.6	460
90	1.5	28.5	7.0	140	6.7	480
	9.0	28.5	6.7	140	6.6	480

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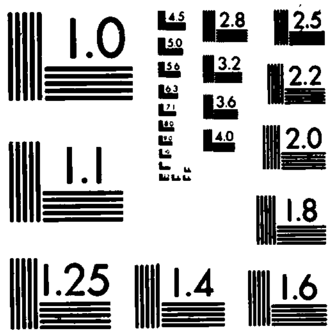

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TABLE E-16. In-situ parameters measured at vertical cross-section, Station R-22, Middle Black Warrior-Tombigbee Rivers, July 29 - August 1, 1979.

% DIST. RT. BANK	SAMPLE DEPTH (Meters)	TEMP. °C	D.O. mg/ℓ	COND. µmhos/cm	pH S.U.	ORP mV
15	0.25	29.5	8.4	160	7.4	440
	1.5	29.0	7.7	160	7.1	440
40	1.5	29.0	7.5	160	7.1	450
	8.0	29.0	7.1	160	7.0	450
75	1.5	28.5	7.5	160	7.0	450
	15	28.0	6.6	160	7.0	450
90	1.5	29.0	7.6	160	7.1	450
	3.0	28.5	6.7	150	7.0	450

TABLE E-17. In-situ parameters measured at vertical cross-section, Station R-8, Middle Black Warrior-Tombigbee Rivers, August 26 - 29, 1979.

% DISTANCE RIGHT BANK	SAMPLE DEPTH (METERS)	TEMP. °C	D.O. mg/l	COND. µmhos/cm	pH S.U.	ORP mV
10	0.3	31.0	9.3	180	7.9	520
	1.0	30.0	9.4	180	7.9	520
	1.6	29.5	8.4	180	7.6	520
	2.0	29.5	7.7	180	7.4	540
50	0.3	31.0	9.2	190	7.7	530
	1.0	29.5	8.4	190	7.4	530
	1.6	29.5	8.2	190	7.4	550
	2.0	29.0	8.0	190	7.3	560
	3.0	29.0	7.7	190	7.3	560
	4.0	29.0	7.6	185	7.3	560
67	0.3	30.5	8.8	190	7.5	530
	1.0	30.5	8.8	190	7.5	530
	1.6	29.5	8.7	190	7.5	530
	2.0	29.5	8.4	190	7.5	550
	7.0	29.0	7.5	190	7.2	560
	20.5	29.0	7.3	190	7.2	560
90	0.3	30.5	8.9	190	7.6	520
	1.0	29.5	8.0	190	7.5	530
	1.6	29.5	7.9	190	7.5	540
	2.0	29.0	7.6	190	7.3	550
	3.0	29.0	7.5	190	7.3	560
	4.0	29.0	7.5	190	7.3	560

TABLE E-18. In-situ parameters measured at vertical cross-section, Station R-22, Middle Black Warrior-Tombigbee Rivers, August 26 - 29, 1979.

% DISTANCE RIGHT BANK	SAMPLE DEPTH (METERS)	TEMP. °C	D.O. mg/l	COND. µmhos/cm	pH S.U.	ORP mV
10	0.3	30.0	7.4	150	7.8	480
	1.6	29.5	6.0	150	7.5	490
	3.0	29.0	5.5	140	7.5	500
	4.0	29.0	5.4	140	7.5	500
40	0.3	29.5	7.4	140	7.8	490
	1.6	29.0	6.0	140	7.5	490
	2.0	29.0	6.0	140	7.5	490
	4.0	29.0	5.5	140	7.5	500
75	0.3	29.0	5.6	140	7.5	460
	1.6	29.0	5.5	140	7.5	460
	2.0	29.0	5.5	140	7.4	460
	3.0	29.0	5.4	140	7.4	460
	6.0	29.0	5.4	140	7.4	460
	10.0	29.0	5.3	140	7.5	460
	14.5	29.0	5.2	140	7.5	460
95	0.3	29.0	5.9	140	7.5	460
	1.6	29.0	5.8	140	7.5	46[illegible]
	3.0	29.0	5.8	140	7.5	460

TABLE E-19. In-situ parameters measured at vertical cross-section, Station R-8, Middle Black Warrior-Tombigbee Rivers, October 1 - 3, 1979.

% DISTANCE RIGHT BANK	SAMPLE DEPTH (METERS)	TEMP. °C	D.O. mg/l	COND. µmhos/cm	pH S.U.	ORP mV
10	2.0	24.0	7.7	215	7.4	450
67	1.6	24.0	7.9	215	7.4	450
	6.5	24.0	7.9	215	7.3	450
75	1.6	24.0	8.0	215	7.4	450
	13.0	24.0	7.9	215	7.3	450
95	1.6	24.0	7.9	215	7.4	450
	5.0	24.0	7.9	215	7.3	450

TABLE E-20. In-situ parameters measured at vertical cross-section, Station R-22, Middle Black Warrior-Tombigbee Rivers, October 1 - 3, 1979.

% DISTANCE RIGHT BANK	SAMPLE DEPTH (METERS)	TEMP. °C	D.O. mg/l	COND. µmhos/cm	pH S.U.	ORP mV
10	1.6	24.0	7.6	170	7.3	470
	2.5	24.0	7.6	170	7.3	470
40	1.6	24.0	7.7	170	7.3	460
	5.0	24.0	7.5	170	7.2	460
	9.0	24.0	6.7	150	7.2	460
	11.0	23.0	6.3	130	7.2	460
67	1.6	24 0	7.4	160	7.2	460
	5.0	23.5	7.3	160	7.2	460
	9.0	23.5	7.3	160	7.2	460
	10.0	23.5	6.6	130	7.1	460
	11.0	23.0	6.5	135	7.1	460
	16.0	23.0	6.2	130	7.1	460
98	1.6	23.5	7.0	150	7.3	460
	5.0	23.5	6.3	120	7.1	470

APPENDIX F

EXTENSIVE MIXING STUDIES

TABLE F-1. Extensive Mixing Studies: Vertical Profile of in-situ parameters, Middle Black Warrior - Tombigbee Rivers, October 1 - 5, 1978.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. μmhos/cm	D.O. mg/ℓ	ORP mV
1 (4179)	10/2/78	20	T	22	7.3	185	7.9	310
		20	B	23	7.3	185	7.7	315
		50	T	23	7.2	185	7.4	310
		50	B	24	7.2	180	7.5	315
		80	T	23	7.3	180	7.6	315
		80	B	23	7.3	185	7.6	315
2 (4176)	10/2/78	20	T	23	7.3	180	7.4	320
		20	B	28	7.3	180	7.4	320
		50	T	22.5	7.2	185	7.4	315
		50	B	23.5	7.2	185	7.2	320
		80	T	23	7.3	180	7.5	320
		80	B	23	7.3	180	7.4	325
3 (4173)	10/2/78	20	T	23	7.5	195	8.5	335
		20	B	24	7.5	195	8.5	335
		50	T	24.5	7.4	195	8.6	340
		50	B	25	7.4	195	8.2	340
		80	T	24	7.4	195	8.8	335
		80	B	25	7.6	195	8.8	335
4 (4169)	10/2/78	20	T	24	7.4	210	8.4	325
		20	B	25	7.4	205	8.4	330
		50	T	24.5	7.3	215	8.1	325
		50	B	25	7.2	210	7.5	330
		80	T	24	7.3	210	8.5	325
		80	B	25	7.3	210	8.4	330

T = 5 feet for depths of 10 feet or greater. For depths less than 10 feet, half the depth.
B = 5 feet from the bottom.

TABLE F-1. Continued.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. μmhos/cm	D.O. mg/ℓ	ORP mV
5 (4166)	10/2/78	20	T	26	8.9	200	11.0	280
		20	B	26	8.9	200	11.2	280
		50	T	25.5	8.8	200	11.6	285
		50	B	25.5	7.5	200	8.6	325
		80	T	26	6.9	200	5.6	280
		80	B	26	8.9	200	5.6	280
6 (4163)	10/2/78	20	T	26	8.6	200	10.0	290
		20	B	25	8.6	200	10.0	290
		50	T	25	8.4	195	9.9	315
		50	B	26	7.2	195	6.7	340
		80	T	26	8.1	195	9.2	315
		80	B	26	8.0	195	9.3	315
7 (4159)	10/3/78	20	T	22	7.3	200	6.8	350
		20	B	25	7.2	195	6.7	350
		50	T	26	7.2	200	6.7	365
		50	B	25.5	7.0	195	5.7	365
		80	T	22	7.3	200	7.4	350
		80	B	24	7.3	200	6.9	350
8 (4156)	10/3/78	20	T	26	7.2	195	7.0	350
		20	B	26	7.0	190	5.9	355
		50	T	26	7.2	195	7.0	350
		50	B	25	7.2	195	6.6	335
		80	T	24	7.3	195	6.7	340
		80	B	25	7.2	190	6.0	345

T = 5 feet for depths of 10 feet or greater. For depths less than 10 feet, half the depth.
B = 5 feet from the bottom.

TABLE F-1 . Continued.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. µmhos/cm	D.O. mg/ℓ	ORP mV
9 (4153)	10/3/78	20	T	26	7.4	195	6.8	345
		20	B	26	7.1	195	5.7	350
		50	T	25.5	7.2	195	7.0	355
		50	T	24	7.1	195	6.2	350
		80	T	25	7.3	195	6.9	350
		80	B	26	7.2	195	6.3	350
10 (4149)	10/3/78	20	T	26	7.5	195	8.3	340
		20	B	26	7.4	195	8.2	345
		50	T	26.5	7.3	195	7.9	350
		50	B	26	7.2	195	7.6	360
		80	T	26	7.4	195	8.0	345
		80	B	26	7.4	195	7.9	350
12 (4146)	10/3/78	20	T	25	7.6	200	8.4	340
		20	B	26	7.4	200	7.6	350
		50	T	26.5	7.6	195	8.3	345
		50	B	26.5	7.2	195	7.1	350
		80	T	25	7.6	195	8.3	345
		80	B	26	7.6	115	8.3	340
13 (4143)	10/4/78	20	T	25	7.7	180	8.2	345
		20	B	26	7.6	180	7.8	345
		50	T	28	7.6	180	7.7	345
		50	B	27	7.3	180	7.0	360
		80	T	24	7.8	185	7.8	345
		80	B	26	7.8	185	7.8	345

T = 5 feet for depths of 10 feet or greater. For depths less than 10 feet, half the depth.
B = 5 feet from the bottom.

TABLE F-1. Continued.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. μmhos/cm	D.O. mg/ℓ	ORP mV
14 (4139)	10/4/78	20	T	27	7.6	180	7.6	320
		20	B	28	7.6	180	7.7	320
		50	T	25	7.6	185	8.3	345
		50	B	27	7.3	180	6.4	300
		80	T	27	7.4	185	7.7	325
		80	B	30	7.5	180	7.6	330
15 (4136)	10/4/78	20	T	28	7.9	195	8.2	315
		20	B	28	7.9	195	8.2	315
		50	T	28	7.7	190	8.0	315
		50	B	28	7.3	185	6.6	340
		80	T	27	7.9	185	8.5	315
		80	B	28	7.8	185	8.0	320
16 (4133)	10/4/78	20	T	26	8.0	185	8.1	325
		20	B	26	8.0	185	8.1	325
		50	T	27	7.7	200	7.7	325
		50	B	26.5	7.2	200	6.2	280
		80	T	25	7.9	200	8.0	330
		80	B	26	7.9	200	7.8	330
17 (3123)	10/1/78	20	T	24.5	7.8	160	8.0	290
		20	B	25.5	7.7	160	7.6	300
		50	T	25	7.8	165	7.8	310
		50	B	25.5	7.7	160	7.3	310
		80	T	24.5	7.8	160	8.4	300
		80	B	25	7.8	160	7.9	300

T = 5 feet for depths of 10 feet or greater. For depths less than 10 feet, half the depth.
B = 5 feet from the bottom.

TABLE F-1. Continued.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. µmhos/cm	D.O. mg/ℓ	ORP mV
18 (3119)	10/1/78	20	T	25	8.2	165	8.2	290
		20	B	25	8.0	165	7.0	300
		50	T	23	7.9	170	6.6	290
		Miss	Miss	Miss	Miss	Miss	Miss	Miss
		80	T	23	7.9	170	6.7	285
		80	B	25	7.9	165	6.3	295
19 (3116)	10/1/78	20	T	25.5	7.8	170	5.4	300
		20	B	25.5	7.7	170	5.3	300
		50	T	25	7.7	170	5.2	310
		50	B	25.5	7.6	170	4.4	315
		80	T	25.5	8.0	170	7.1	305
		80	B	25	7.7	170	4.8	315
20 (3113)	10/5/78	20	T	23	7.4	170	5.5	315
		20	B	23	7.4	170	5.4	345
		50	T	26	7.3	175	5.2	365
		50	B	26	7.2	175	5.2	370
		80	T	23	7.4	170	5.6	340
		80	B	25	7.4	170	5.5	350
21 (3109)	10/5/78	20	T	25	7.8	190	6.8	340
		20	B	24.5	7.7	190	6.3	340
		50	T	26	7.5	190	6.0	355
		50	B	25	7.3	190	5.6	360
		80	T	25	7.7	190	6.6	345
		80	B	25	7.7	190	6.4	345

T = 5 feet for depths of 10 feet or greater. For depths less than 10 feet, half the depth.
B = 5 feet from the bottom.

TABLE F-1 . Continued.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. μmhos/cm	D.O. mg/ℓ	ORP mV
22 (3106)	10/5/78	20	T	25	7.6	200	7.3	350
		20	B	25	7.5	200	7.1	350
		50	T	26	7.4	200	7.3	355
		50	B	27	7.0	200	5.6	385
		80	T	27	7.6	200	7.3	350
		80	B	27	7.4	200	7.0	365
23 (3103)	10/4/78	20	T	25	7.9	195	7.7	340
		20	B	25	7.9	200	7.6	340
		50	T	27	7.6	190	7.3	345
		50	B	27	7.2	190	5.3	320
		80	T	25	7.9	195	7.7	340
		80	B	25	7.7	195	7.0	345

T = 5 feet for depths of 10 feet or greater. For depths less than 10 feet, half the depth.
B = 5 feet from the bottom.

TABLE F-2. Extensive Mixing Studies: Vertical Profile of in-situ parameters, Middle Black Warrior - Tombigbee Rivers, February 27 - March 2, 1979.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. µmhos/cm	D.O. mg/ℓ	ORP mV
1 (4179)	3/1/79	20	1	10.0	6.3	150	11.6	440
		20	8	10.0	6.3	150	11.6	440
		50	1	10.0	6.2	155	11.5	450
		50	12	10.0	6.2	155	11.5	450
		80	1	10.0	6.3	155	11.5	440
		80	11	10.0	6.3	155	11.5	440
2 (4176)	3/1/79	20	1	10.0	6.3	155	11.6	430
		20	10	10.0	6.3	155	11.6	440
		50	1	10.0	6.5	155	11.5	430
		50	10	10.0	6.5	155	11.4	430
		80	1	10.0	6.5	155	11.3	430
		80	5	10.0	6.5	155	11.4	430
3 (4173)	3/1/79	20	1	11.0	7.1	160	11.2	390
		20	8.5	11.0	7.1	160	11.2	390
		50	1	11.0	7.1	160	11.4	400
		50	10	11.0	7.1	160	11.4	400
		80	1	11.0	7.1	160	11.4	390
		80	4.5	11.0	7.1	160	11.4	390
4 (4169)	2/29/79	20	1	11.0	7.2	160	11.2	390
		20	4	11.0	7.2	160	11.3	390
		50	1	11.0	7.2	160	11.3	390
		50	7	11.0	7.2	160	11.3	390
		80	1	11.0	7.2	160	11.4	395
		80	10	11.0	7.2	160	11.4	395

TABLE F-2. Continued.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. µmhos/cm	D.O. mg/l	ORP mV
5 (4166)	2/28/79	20	1	10.0	6.8	140	11.4	415
		20	-	10.0	6.8	140	11.5	420
		50	1	10.0	6.9	140	11.6	420
		50	12	10.0	6.8	145	11.6	415
		80	1	10.0	6.8	145	11.5	420
		80	7	10.0	6.8	145	11.5	420
6 (4163)	2/28/79	20	1	10.0	6.8	140	11.2	410
		20	9	10.0	6.8	140	11.2	410
		50	1	10.0	6.9	140	11.1	410
		50	14	10.0	6.7	140	11.2	410
		80	1	10.0	6.8	140	11.2	410
		80	6	10.0	6.8	140	11.2	410
7 (4159)	2/28/79	20	1	9.5	6.8	140	11.4	410
		20	3	9.5	6.8	140	11.4	410
		50	1	9.5	6.8	140	11.2	410
		50	12	9.5	6.8	140	11.2	420
		80	1	9.5	6.9	140	11.1	410
		80	9	9.5	6.8	140	11.2	410
8 (4153)	2/28/79	20	1	9.5	6.8	135	11.2	410
		20	4	9.5	6.7	135	11.2	410
		50	1	9.5	6.7	135	11.1	420
		50	8.5	9.5	6.7	135	11.2	420
		80	1	9.5	6.8	135	11.0	410
		80	4.5	9.5	6.8	135	11.0	415

TABLE F-2. Continued

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. μmhos/cm	D.O. mg/ℓ	ORP mV
10 (4149)	2/26/79	20	1	7.5	6.7	150	12.0	440
		20	11	7.5	6.7	150	11.8	440
		50	1	7.5	6.7	150	11.8	440
		50	14	7.5	6.7	150	11.8	440
		80	1	7.5	6.8	150	11.8	440
		80	13	7.5	6.8	150	11.8	440
12 (4146)	2/26/79	20	1	9.0	6.8	150	11.4	410
		20	6	9.0	6.8	150	11.4	410
		50	1	9.0	6.8	150	11.6	410
		50	15	9.0	6.8	150	11.4	410
		80	1	9.0	6.8	150	11.4	420
		80	12	9.0	6.8	150	11.4	420
13 (4143)	2/26/79	20	1	9.0	6.8	150	11.1	410
		20	14	9.0	6.8	150	11.0	420
		50	1	8.5	6.8	150	11.0	420
		50	16	9.0	6.8	150	11.1	420
		80	1	9.0	6.8	150	11.0	420
		80	8	9.0	6.8	150	11.0	420
14 (4139)	2/26/79	20	1	9.5	6.8	160	11.1	420
		20	19	9.5	6.8	160	11.0	410
		50	1	9.5	6.9	150	11.0	410
		50	19	9.5	6.8	160	11.0	410
		80	1	9.5	6.8	160	11.0	410
		80	19	9.5	6.8	160	11.0	410

TABLE F-2. Continued

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. μmhos/cm	D.O. mg/ℓ	ORP mV
15 (4136)	2/26/79	20	1	9.5	6.9	160	11.3	385
		20	6	9.0	6.9	160	11.3	390
		50	1	9.5	6.9	160	11.2	390
		50	19	9.0	6.9	160	11.2	390
		80	1	9.0	6.8	160	11.2	390
		80	10	9.0	6.9	160	11.2	390
16 (4133)	2/26/79	20	1	---	6.9	160	11.2	390
		20	*	---	6.9	160	11.2	385
		50	1	---	6.9	155	11.0	390
		50	20	---	7.0	155	11.0	380
		80	1	---	6.9	160	11.0	390
		80	*	10.5	6.9	160	10.9	400
17 (3123)	2/27/79	20	1	10.5	7.5	110	9.5	400
		20	10	10.5	7.5	110	9.5	400
		50	1	10.5	7.5	110	9.8	400
		50	12	10.5	7.4	110	9.5	410
		80	1	10.5	7.4	110	9.5	410
		80	±13*	10.5	7.5	110	9.5	400
18 (3119)	2/27/79	20	1	10.5	7.6	110	9.5	390
		20	11	10.5	7.5	110	9.5	390
		50	1	10.5	7.5	110	9.4	390
		50	14	10.5	7.5	110	9.4	390
		80	1	10.5	7.5	110	9.4	380
		80	12	10.5	7.5	110	9.4	380

*Depth finder malfunctioned.
Dash (-) indicates measurement not performed.

TABLE F-2. Continued

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. µmhos/cm	D.O. mg/ℓ	ORP mV
19 (3116)	2/27/79	20	1	12.5	7.6	110	9.2	380
		20	9	12.5	7.6	110	9.2	380
		50	1	12.5	7.5	110	9.2	390
		50	12	12.5	7.6	110	9.2	390
		80	1	12.5	7.6	115	9.2	385
		80	14	12.5	7.6	115	9.2	390
20 (3113)	2/27/79	20	1	12.0	7.7	120	9.2	365
		20	17	12.0	7.6	120	9.2	370
		50	1	12.0	7.7	120	9.2	375
		50	16	12.0	7.6	120	9.2	370
		80	1	12.0	7.7	120	9.2	370
		80	14	12.0	7.6	120	9.1	370
21 (3109)	2/27/79	20	1	13.0	7.6	120	9.4	370
		20	17	13.0	7.5	120	9.3	380
		50	1	13.0	7.6	120	9.2	370
		50	18	13.0	7.6	120	9.1	370
		80	1	13.0	7.6	120	9.2	370
		80	5	13.0	7.6	120	9.2	370
23 (3103)	2/27/79	20	1	10.5	7.2	130	10.1	400
		20	7	10.5	7.2	130	10.0	400
		50	1	10.5	7.2	130	10.1	400
		50	19	10.5	7.1	130	10.1	400
		80	1	10.5	7.2	130	10.0	410
		80	9	10.5	7.2	130	10.1	400

TABLE F-3. Extensive Mixing Studies: Vertical Profile of in-situ parameters Middle Black Warrior - Tombigbee Rivers, August 26 - 29, 1979.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. µmhos/cm	D.O. mg/ℓ	ORP mV
1 (4179)	8/26/79	10	0.3	28.0	7.3	220	7.4	440
		10	5	28.0	7.3	210	7.4	440
		50	1.6	28.0	7.1	210	7.4	440
		50	5	28.0	7.1	210	7.4	440
		90	0.3	28.0	7.1	210	7.4	440
		90	5	28.0	7.1	210	7.4	440
2 (4176)	8/26/79	10	0.3	28.0	7.2	210	7.1	460
		10	6	28.0	7.2	210	7.1	460
		50	1.6	28.0	7.2	210	7.1	460
		50	6	28.0	7.2	210	7.0	460
		90	0.3	28.0	7.2	210	7.1	460
		90	1.5	28.0	7.2	210	7.1	460
3 (4173)	8/26/79	10	0.3	28.5	7.3	200	7.3	450
		10	4	28.5	7.3	200	7.3	450
		50	1.6	28.5	7.3	200	7.3	450
		50	5	28.5	7.3	200	7.3	450
		80	0.3	28.5	7.3	200	7.4	450
		80	3	28.5	7.3	200	7.2	450
4 (4169)	8/26/79	10	0.3	29.0	7.4	210	7.6	450
		10	2	28.5	7.3	210	7.5	450
		50	1.5	28.5	7.3	210	7.3	450
		50	3.5	28.5	7.3	210	7.1	450
		90	0.3	28.5	7.4	210	7.6	460
		90	2	28.5	7.3	210	7.4	460

TABLE F-3. Continued.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. μmhos/cm	D.O. mg/ℓ	ORP mV
5 (4166)	8/26/79	10	0.3	29.0	7.4	200	7.9	440
		10	5.5	29.0	7.4	200	7.7	440
		50	1.6	29.0	7.4	200	7.7	440
		50	3.5	28.5	7.4	200	7.4	440
		90	0.3	28.5	7.4	200	7.8	420
		90	---	---	---	---	---	---
6 (4163)	8/29/79	10	0.3	29.5	7.6	190	8.5	550
		10	7.5	29.0	7.4	190	7.9	560
		50	1.6	29.0	7.4	190	8.6	560
		50	7.5	29.0	7.4	190	8.0	560
		90	0.3	30.0	7.6	190	8.9	560
		90	2.0	29.0	7.4	190	8.0	560
7 (4159)	8/29/79	10	0.3	30.0	7.6	190	9.1	530
		10	6	29.0	7.4	190	8.1	520
		50	1.6	29.5	7.6	190	8.8	530
		50	9	29.0	7.4	190	7.9	520
		95	0.3	30.0	7.6	190	9.1	530
		95	2.5	29.5	7.4	190	8.7	520
8 (4156)	8/29.79	10	0.3	31.0	7.9	180	9.3	520
		10	1.6	29.5	7.6	180	8.4	520
		50	0.3	31.0	7.7	190	9.2	530
		50	4	29.5	7.4	185	7.6	560
		95	0.3	30.5	7.6	180	8.9	520
		95	4	29.0	7.3	180	7.5	560

Dash (---) indicates too shallow to sample.

TABLE F-3. Continued.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP ^{0}C	pH S.U.	SP. COND. µmhos/cm	D.O. mg/ℓ	ORP mV
9 (4153)	8/29/79	10	0.3	31.0	7.5	180	8.5	510
		10	2.5	29.0	7.4	180	7.7	530
		50	1.6	29.5	7.3	180	7.8	510
		50	6.5	29.0	7.3	180	7.5	530
		90	0.3	33.5	7.6	180	8.9	500
		90	4.5	29.0	7.4	180	6.7	530
10 (4149)	8/29/79	10	0.3	29.5	7.4	190	8.2	520
		10	3.5	29.5	7.6	190	8.1	520
		50	1.6	29.5	7.4	180	8.2	520
		50	7	29.5	7.3	180	8.1	520
		90	0.3	29.5	7.4	180	8.2	520
		90	3	29.5	7.4	180	8.2	520
12 (4146)	8/28/79	10	0.3	30.0	7.7	170	9.2	470
		10	5	29.0	7.4	170	7.7	480
		50	1.6	29.5	7.5	170	8.6	490
		50	8.5	29.0	7.3	170	7.7	480
		90	0.3	30.0	7.7	170	9.3	470
		90	4.5	29.0	7.4	170	7.6	480
13 (4143)	8/28/79	5	0.3	29.5	7.4	160	7.3	490
		5	2	29.0	7.3	160	7.3	490
		50	1.6	29.5	7.5	160	7.9	490
		50	1.0	29.0	7.2	160	6.8	490
		90	0.3	30.0	7.6	160	8.2	490
		90	4.5	29.0	7.3	160	6.8	490

Table F-3. Continued.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP ^{o}C	pH S.U.	SP. COND. µmhos/cm	D.O. mg/ℓ	ORP mV
14 (4139)	8/28/79	5	0.3	35.5	7.5	160	7.9	480
		5	6	29.0	7.2	150	6.3	480
		50	1.6	34.0	7.7	160	7.7	480
		50	10	28.5	7.2	150	5.8	500
		95	0.3	35.0	7.6	160	8.2	480
		95	2	30.5	7.5	150	7.5	480
15 (4136)	8/28/79	5	0.3	33.5	7.7	160	8.8	450
		5	2	29.5	7.5	160	7.2	450
		50	1.6	31.0	7.6	150	8.3	490
		50	12	29.0	7.2	140	6.3	490
		95	0.3	33.5	7.8	160	8.7	450
		95	3.0	29.5	7.3	150	6.7	450
16 (4133)	8/28/79	5	0.3	30.5	7.6	140	8.2	500
		5	3.5	29.5	7.3	140	7.0	500
		50	1.6	30.0	7.5	140	7.9	490
		50	11	29.0	7.1	140	5.9	500
		95	0.3	31.0	7.6	140	8.1	500
		95	1.5	30.5	7.4	140	7.8	500
17 (3123)	8/27/79	10	0.3	28.0	7.5	140	7.6	450
		10	3	28.0	7.5	140	7.6	450
		50	1.6	28.0	7.5	140	7.6	450
		50	3	28.0	7.4	140	7.6	450
		85	0.3	28.0	7.5	140	7.6	450
		85	2	28.0	7.5	140	7.6	450

TABLE F-3. Continued.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP ^{o}C	pH S.U.	SP. COND. μmhos/cm	D.O. mg/ℓ	ORP mV
18 (3119)	8/27/79	10	0.3	28.0	7.5	140	7.2	440
		10	4	28.0	7.5	140	7.1	440
		50	1.6	28.0	7.5	140	7.2	440
		50	4	28.0	7.5	140	7.2	440
		90	0.3	28.0	7.5	140	7.2	440
		90	1.5	28.0	7.5	140	7.2	440
19 (3116)	8/27/79	10	0.3	28.0	7.6	140	6.5	430
		10	1.5	28.0	7.6	140	6.4	430
		50	1.6	28.0	7.6	140	6.4	430
		50	7.5	28.0	7.6	140	6.2	430
		90	0.3	28.0	7.6	140	6.4	430
		90	4	28.0	7.6	140	6.2	430
20 (3113)	8/27/79	10	0.3	31.5	8.7	150	8.7	360
		10	7	29.0	7.6	150	5.6	420
		50	1.6	29.5	7.9	150	6.7	410
		50	12	28.5	7.6	150	5.6	420
		90	0.3	30.5	8.6	150	8.8	360
		90	4	29.0	7.7	150	5.7	420
21 (3109)	8/28/79	5	0.3	28.5	7.6	140	5.6	440
		5	1	28.5	7.6	140	5.6	440
		50	1.6	29.0	7.6	140	5.7	440
		50	12.5	28.5	7.5	140	5.3	440
		90	0.3	29.0	7.6	140	6.2	440
		90	20	29.0	7.5	140	5.7	440

TABLE F-3. Continued.

STATION NO. (STORET CODE NO.)	DATE	% DISTANCE FROM RIGHT BANK	SAMPLE DEPTH METERS	TEMP °C	pH S.U.	SP. COND. µmhos/cm	D.O. mg/ℓ	ORP mV
22 (3106)	8/28/79	10	0.3	30.0	7.8	150	7.4	480
		10	4.0	29.0	7.5	140	5.4	500
		75	1.6	29.0	7.5	140	5.6	460
		75	14.5	29.0	7.5	140	5.2	460
		95	0.3	29.0	7.5	140	5.8	460
		95	3	29.0	7.5	140	5.8	460
23 (3103)	8/28/79	5	0.3	29.0	7.5	150	5.7	460
		5	3	29.0	7.5	150	5.6	460
		50	1.6	29.0	7.5	140	5.8	460
		50	13	29.0	7.5	140	4.8	460
		90	0.3	29.0	7.6	140	5.7	460
		90	1.5	29.0	7.6	140	5.4	460

APPENDIX G

STRATIFICATION STUDIES

TABLE G-1. Physical-chemical analyses of Bottom samples at Station R-20 during oxygen stratification, Middle Black Warrior-Tombigbee Rivers, August, 1978, and June, 1979.

STORET CODE	PARAMETER	STATION	20-T	20-B		20-1	20-B
		DATE	8/78	8/78		6/79	6/79
		TIME	1650	1650		1530	1530
		UNITS					
NONE	Depth	feet	40	-		43	43
00400	pH	S.U.	8.9	7.3		8.0	7.2
00010	Temperature	^{o}C	32.5	30.0		28.0	26.0
00299	DO	mg/ℓ	9.1	0.5		*	*
00090	ORP	mV	250	15		330	370
00094	Sp. Cond.	µmhos/cm	35	62		130	130
00077	Trans., S. D.	inches	-	-		0.4	-
00034	L. Trans.	feet	-	-		3	-
00410	Alk., Total	mg/ℓ	59	-		44	43
00681	DOC	mg/ℓ	13.9	-		<2	<2
00680	TOC	mg/ℓ	8.2	8.1		<2	<2
32211	Chlorophyll, a	µg/ℓ	4	-		29	-
32212	Chlorophyll, b	µg/ℓ	<1	-		5	-
32214	Chlorophyll, c	µg/ℓ	<1	-		5	-
00080	Color, True	Pt. Co.	12	12		19	18
31616	Fecal Coliform	/100 mℓ	<1	-		<10	-
31673	Fecal Strep.	/100 mℓ	<1	-		30	-
NONE	F.C./F.S. Ratio		1	-		<1	-
70300	Res., Tot. Filt.	mg/ℓ	97	82		107	110
00530	Res., Tot. Nonf.	mg/ℓ	8	10		22	17
00076	Turbidity	Hach FTU	4	8		25	26
00900	Hardness (Calc.)	mg/ℓ	53.6	-		-	-

Dash (-) indicates analysis not required or not performed.
Asterisk (*) indicates abberant D.O. measurement due to damaged probe.
T = TOP, B = BOTTOM

TABLE G-1. Continued.

STORET CODE	PARAMETER	STATION	20-T	20-B		20-T	20-B
		DATE	8/78	8/78		6/79	6/79
		TIME	1650	1650		1530	1530
		UNITS					
70996	ATP	mg/ℓ	-	-		*	*
00916	Ca, Total	mg/ℓ	19.0	33.0		-	-
00940	Cl	mg/ℓ	14	12		-	-
01046	Fe, Dissolved	μg/ℓ	75	27		480	110
74010	Fe, Total	mg/ℓ	0.24	0.96		1.44	1.50
00927	Mg, Total	mg/ℓ	1.4	1.5		-	-
01056	Mn, Dissolved	μg/ℓ	13	209		<50	<50
01055	Mn, Total	mg/ℓ	0.02	19		0.080	0.060
00610	NH_3	mg/ℓ	<0.01	0.09		0.22	0.22
00630	NO_2-NO_3	mg/ℓ	<0.01	-		0.66	0.79
00625	TKN	mg/ℓ	0.6	0.8		0.7	0.7
00640	TIN, (Calc.)	mg/ℓ	<0.01	-		0.88	1.01
00605	TON, (Calc.)	mg/ℓ	0.6	-		0.5	0.5
00600	N, Total (Calc.)	mg/ℓ	0.6	-		1.4	1.5
00671	Diss. o-P	mg/ℓ	0.009	0.025		0.044	0.045
00665	P, Total	mg/ℓ	0.04	0.06		0.10	0.10
00937	K, Total	mg/ℓ	1.27	1.52		-	-
00929	Na, Total	mg/ℓ	9.36	8.22		-	-
00946	SO_4, Dissolved	mg/ℓ	10	10		9	8
00745	S, Total	mg/ℓ	1.5	-		<0.1	<0.1
01092	Zn	μg/ℓ	<50	<50		57	<10
00405	CO_2, Calc.	mg/ℓ	-	-		1	5

Dash (-) indicates analysis not required or not performed.
Asterisk (*) indicates results invalid.
T = TOP, B = BOTTOM

APPENDIX H

GRAIN SIZE ANALYSIS - SEDIMENTS

TABLE H-1. Results of Grain Size Analysis of Sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978.

STATION	% GRAVEL	% SAND			% FINES	CLASSIFICATION
		COARSE	MEDIUM	FINE	SILT & CLAY	(after USDA, 1951)
1	10	4	23	63	0	Gravelly sand
2	5	3	28	59	5	Sand
3	29	2	5	44	19	Gravelly loamy sand
4	-	<1	19	44	37	Sandy loam
5	12	1	8	62	17	Gravelly sandy loam
6	-	1	9	47	43	Sandy loam
7	-	<1	20	45	35	Sandy loam
8	-	1	18	32	39/10*	Loam
9	-	-	13	52	35	Sandy loam
10	-	-	10	75	15	Loamy sand
12	-	1	26	64	9	Sand
13	-	1	8	83	8	Sand
14	-	<1	1	59	40	Sandy loam
15	<1	1	1	74	24	Sandy loam
16	18	2	3	55	22	Gravelly sandy loam
17	<1	<1	6	94	0	Sand
18	-	<1	22	64	14	Sand
19	-	2	25	43	30	Sandy loam
20	15	2	10	54	19	Gravelly loamy sand
21	7	1	21	44	27	Sandy loam
22	1	1	2	51	46	Sandy loam
23	-	<1	<1	35	37/28	Clay loam

* 39% SILT and 10% CLAY

TABLE H-2. Results of Grain Size Analysis of Sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979.

STATION	% GRAVEL	% SAND			% FINES	CLASSIFICATION
		COARSE	MEDIUM	FINE	SILT & CLAY	(after USDA, 1951)
1	1	8	42	30	19	Loamy sand
2	6	5	36	40	13	Sand
3	22	2	22	50	4	Gravelly sand
4	2	6	21	30	32/9*	Sandy loam
5	5	24	26	19	18/8	Sandy loam
6	-	<1	14	45	29/12	Sandy loam
7	-	<1	57	29	14	Sand
8	-	<1	12	21	48/19	Silt loam
9	8	2	6	39	32/13	Sandy loam
10	37	4	20	30	9	Gravelly sand
12	5	4	67	19	5	Sand
13	-	1	17	55	20/7	Sandy loam
14	-	<1	10	70	20	Loamy sand
15	-	<1	3	62	25/10	Sandy loam
16	-	<1	4	69	16/11	Sandy loam
17	59	2	6	24	9	Gravelly sand
18	-	8	27	52	13	Sand
19	1	1	12	60	12/14	Sandy loam
20	20	2	3	31	20/24	Gravelly sandy clay loam
21	-	-	1	46	29/24	Loam
22	4	2	2	27	29/36	Clay loam
23	3	4	8	44	23/18	Sandy loam

* 32% SILT and 9% CLAY.

APPENDIX I

GRAIN SIZE DISTRIBUTION GRAPHS - SEDIMENTS

FIGURE I-1. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 1.

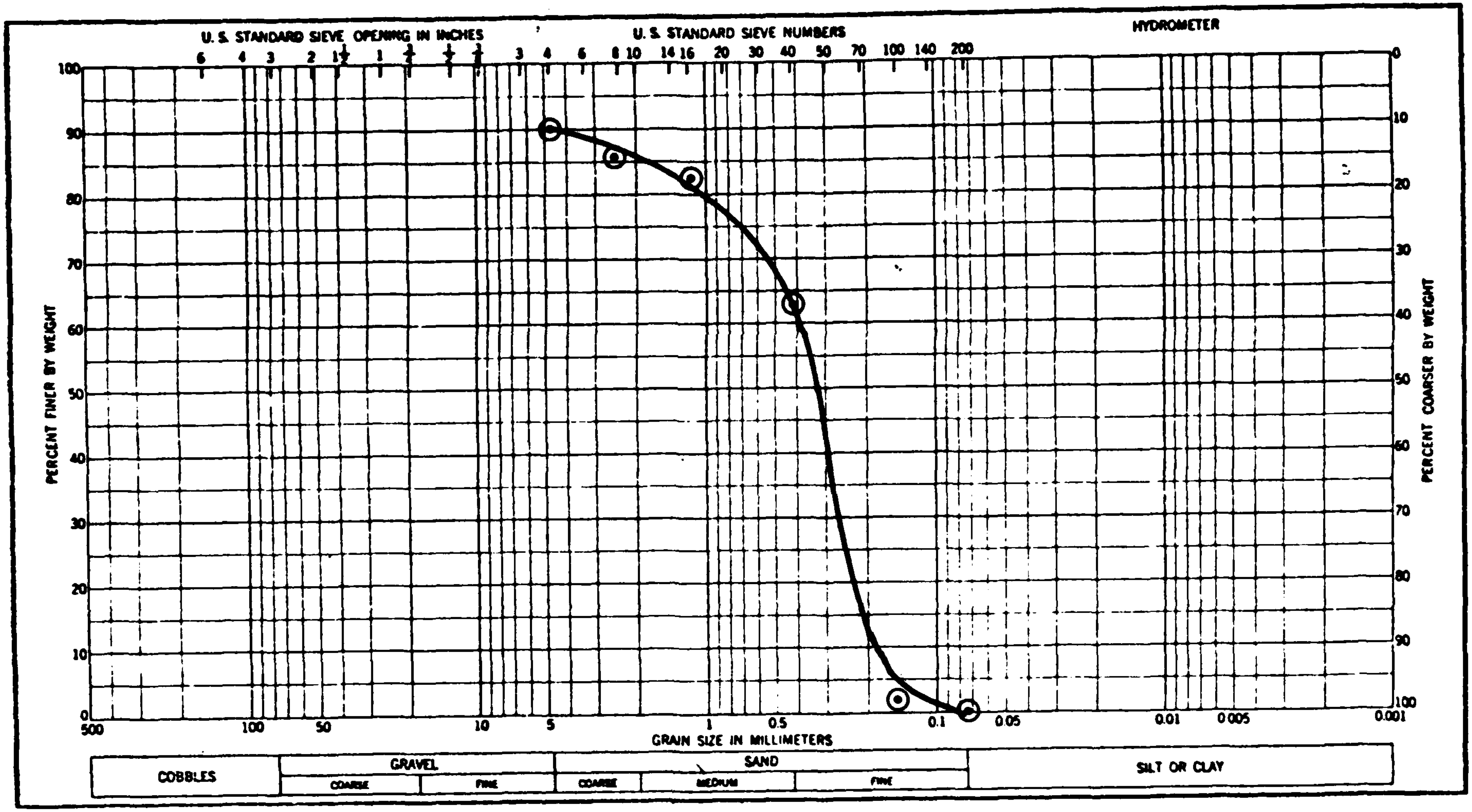


FIGURE I-2. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 2.

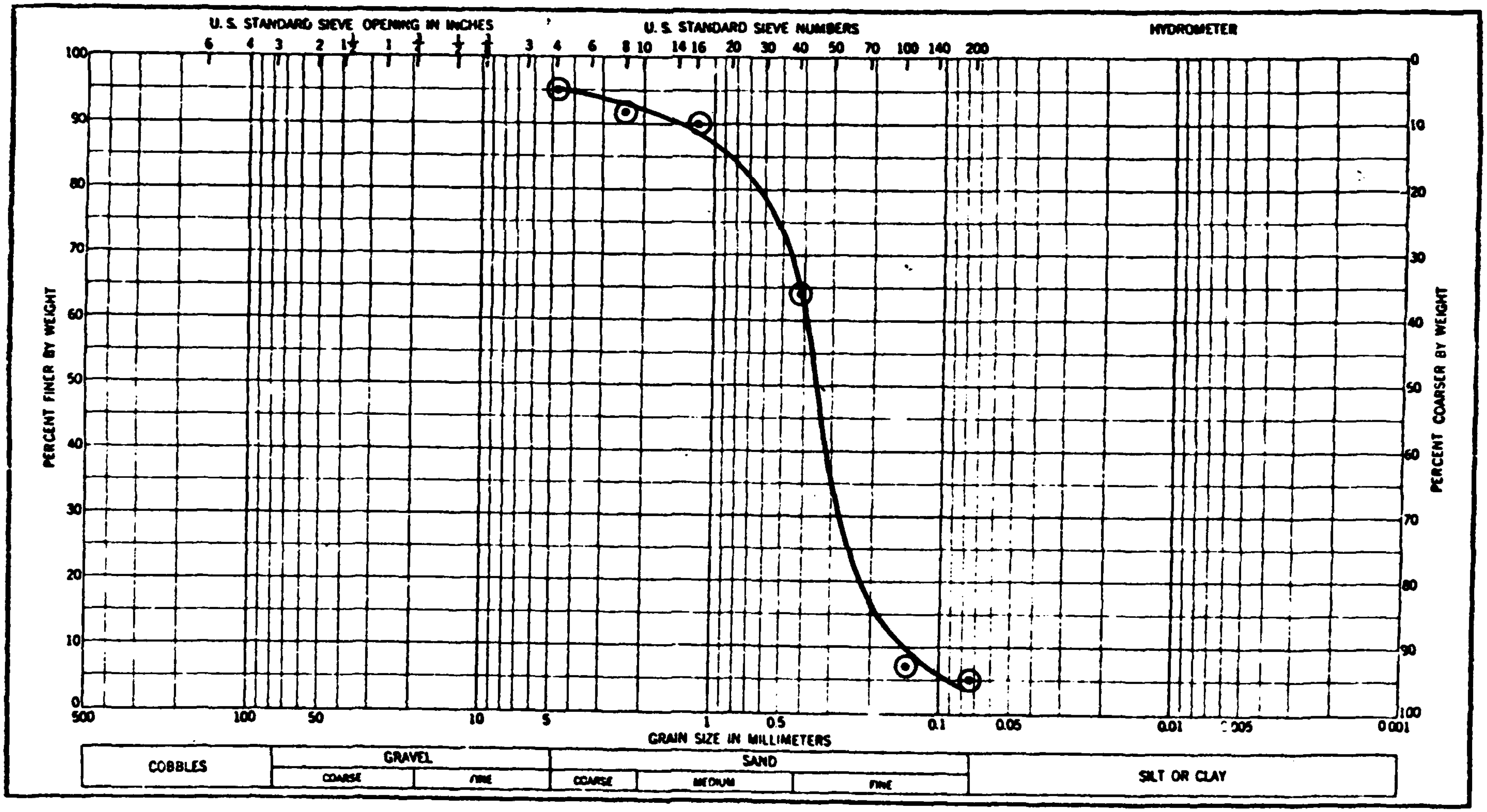


FIGURE I-3. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 3.

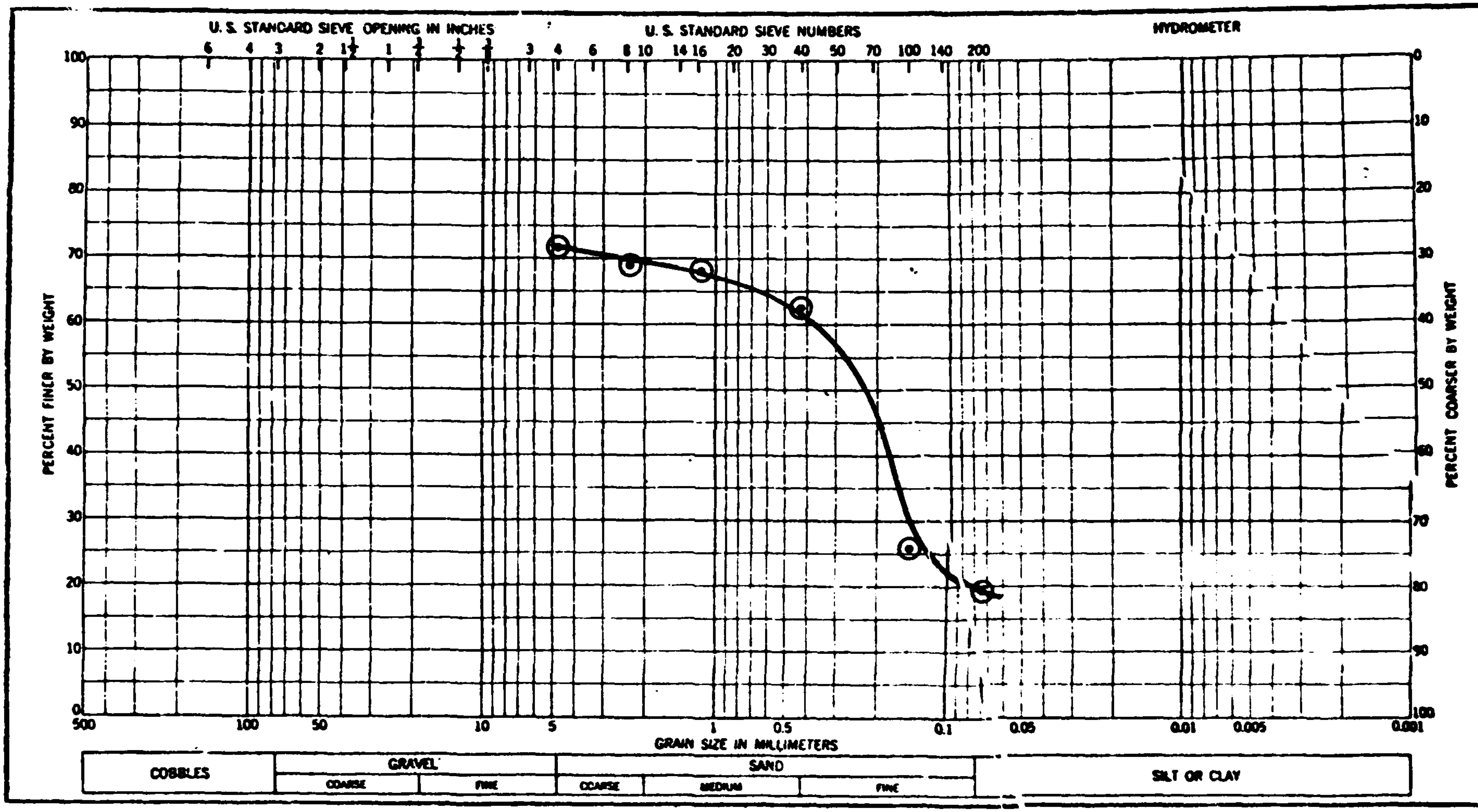


FIGURE I-4. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 4.

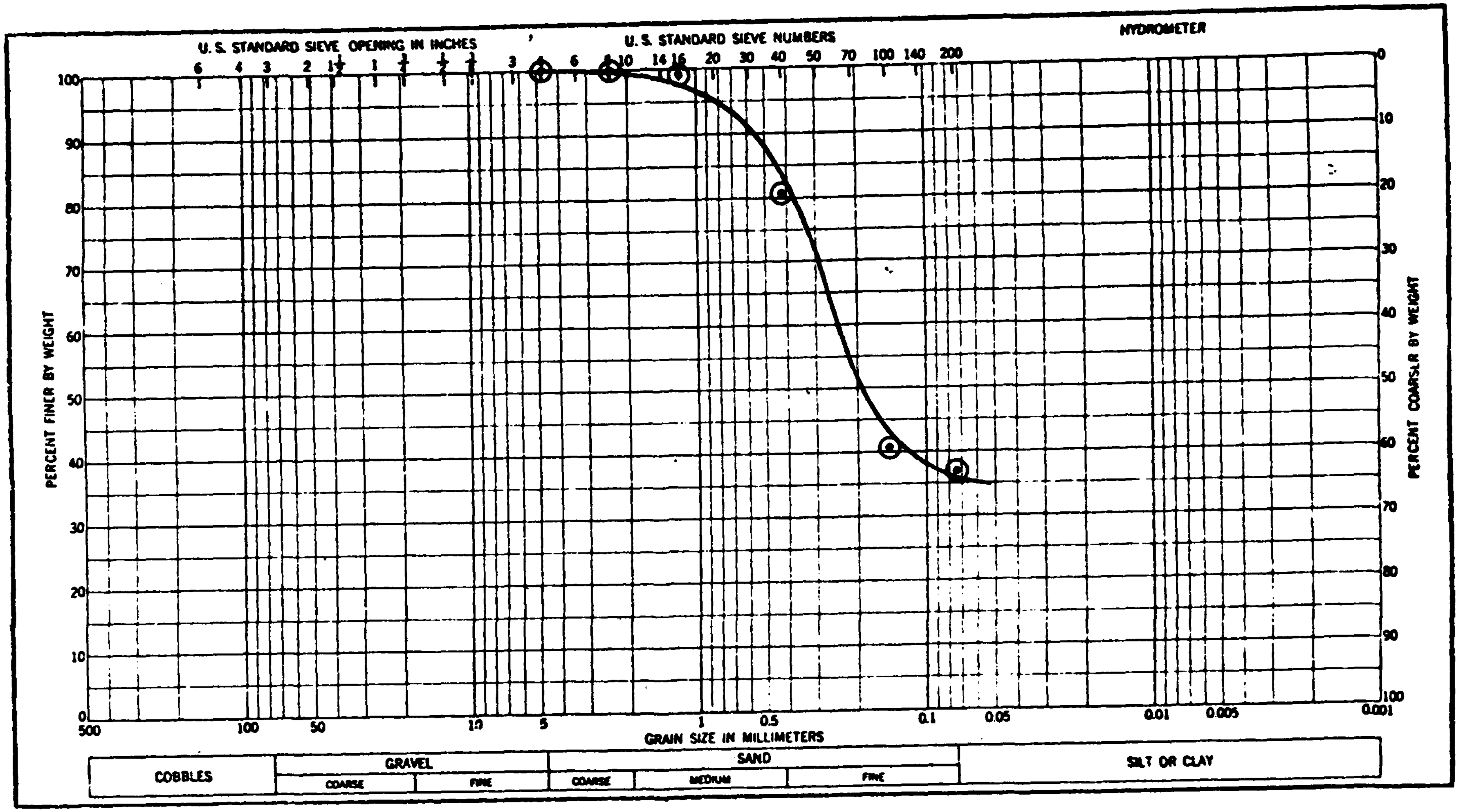


FIGURE I-5. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 5.

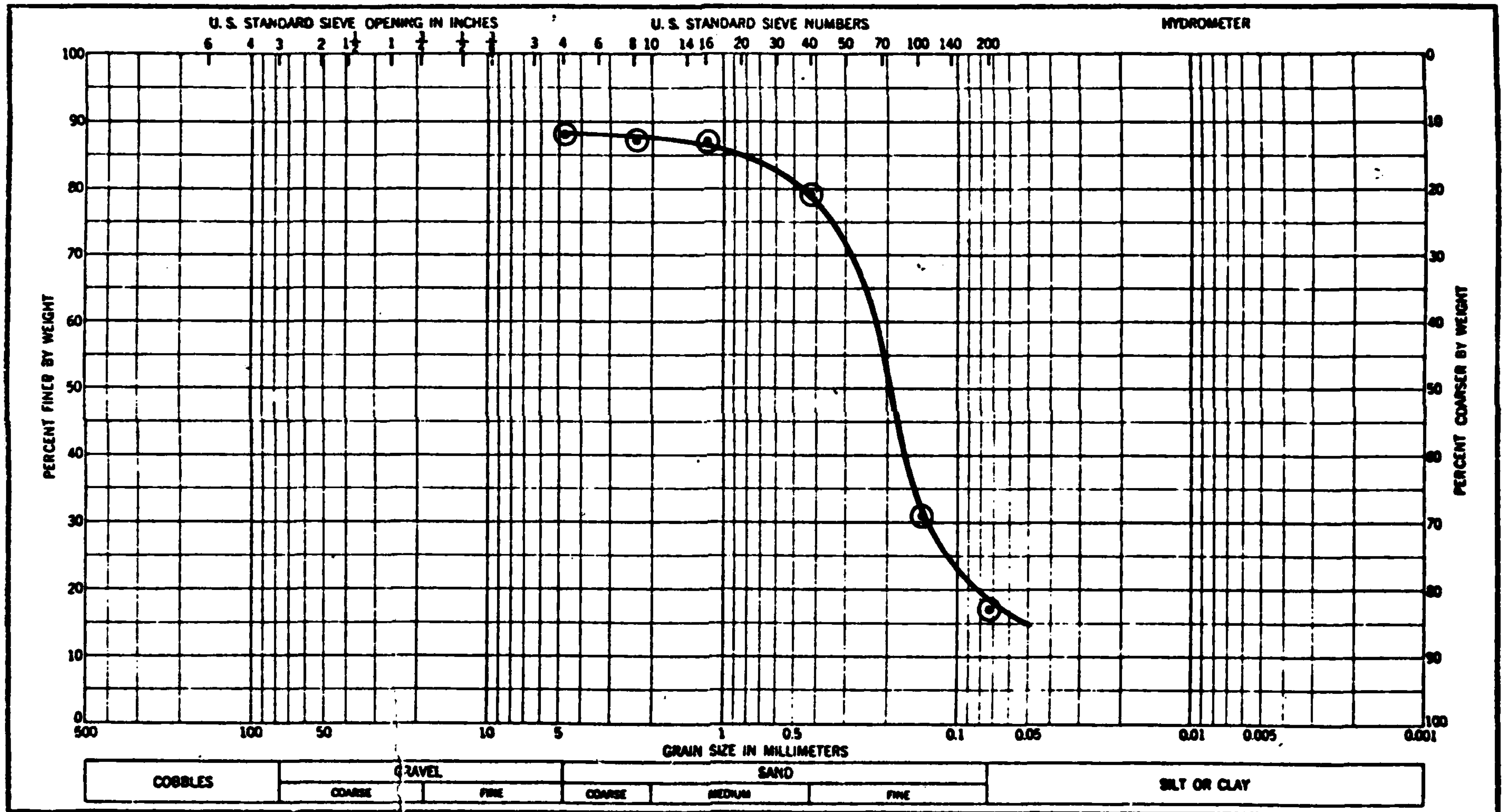


FIGURE I-6. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 6.

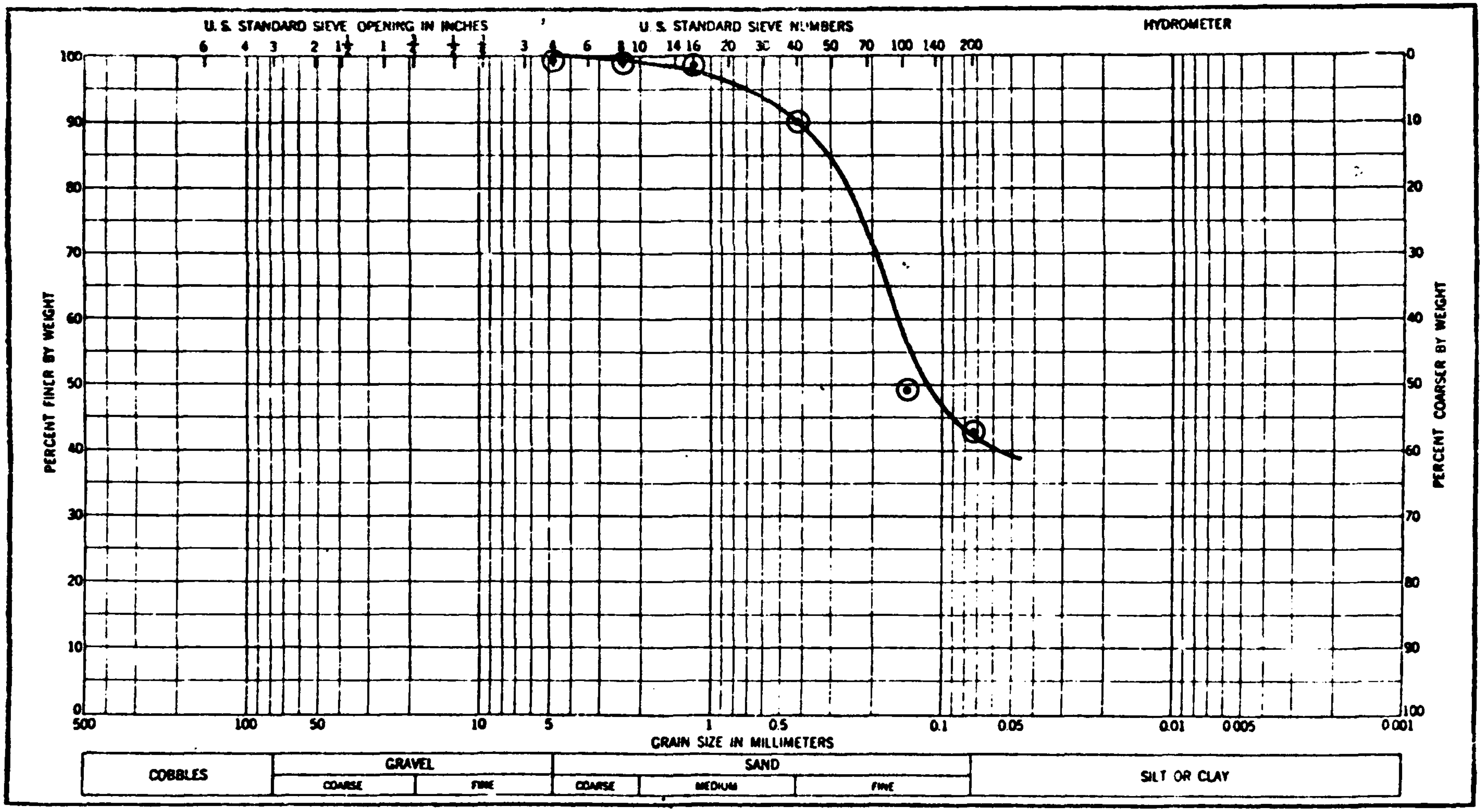


FIGURE I-7. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 7.

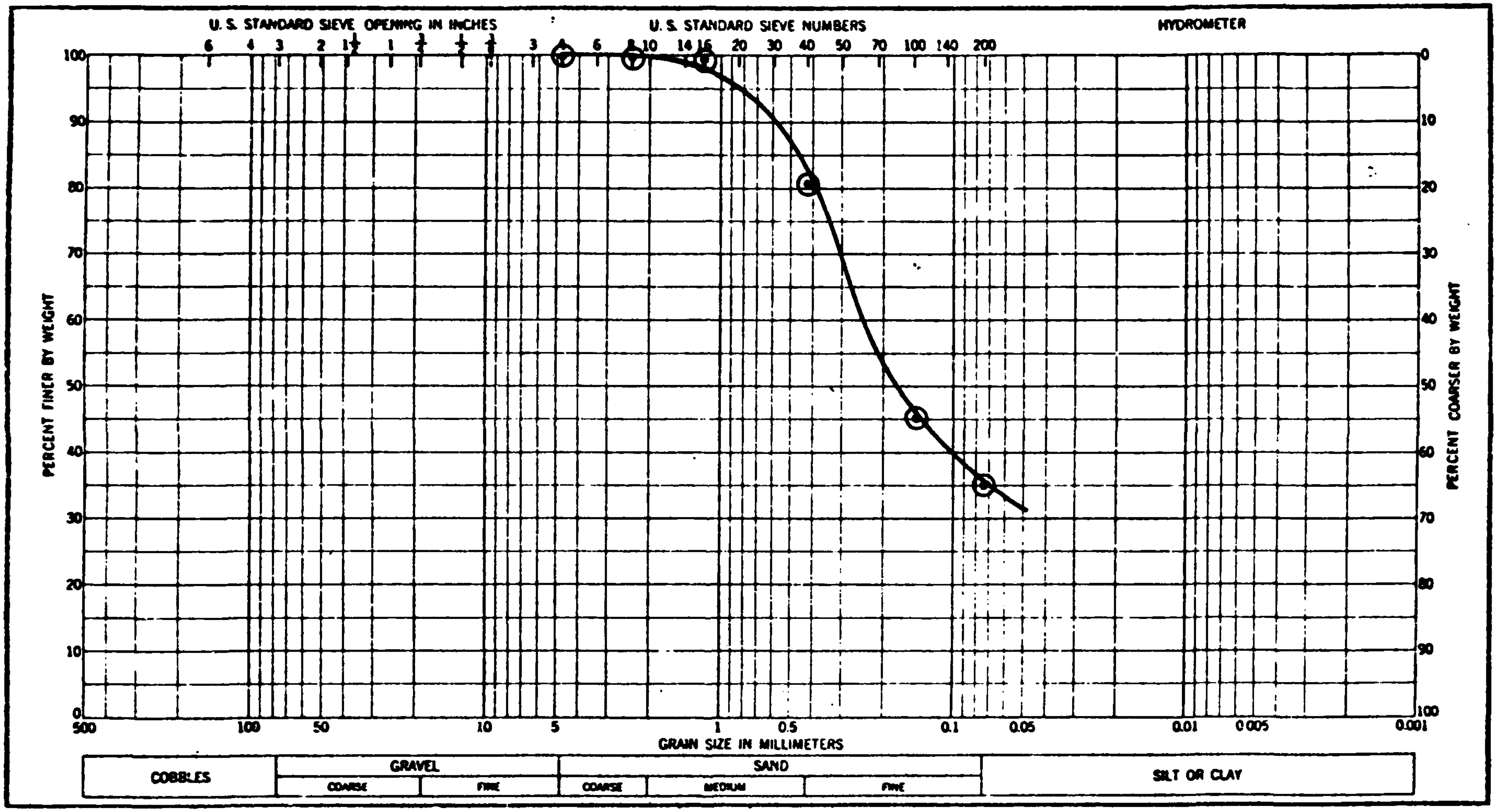


FIGURE I-8 Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 8.

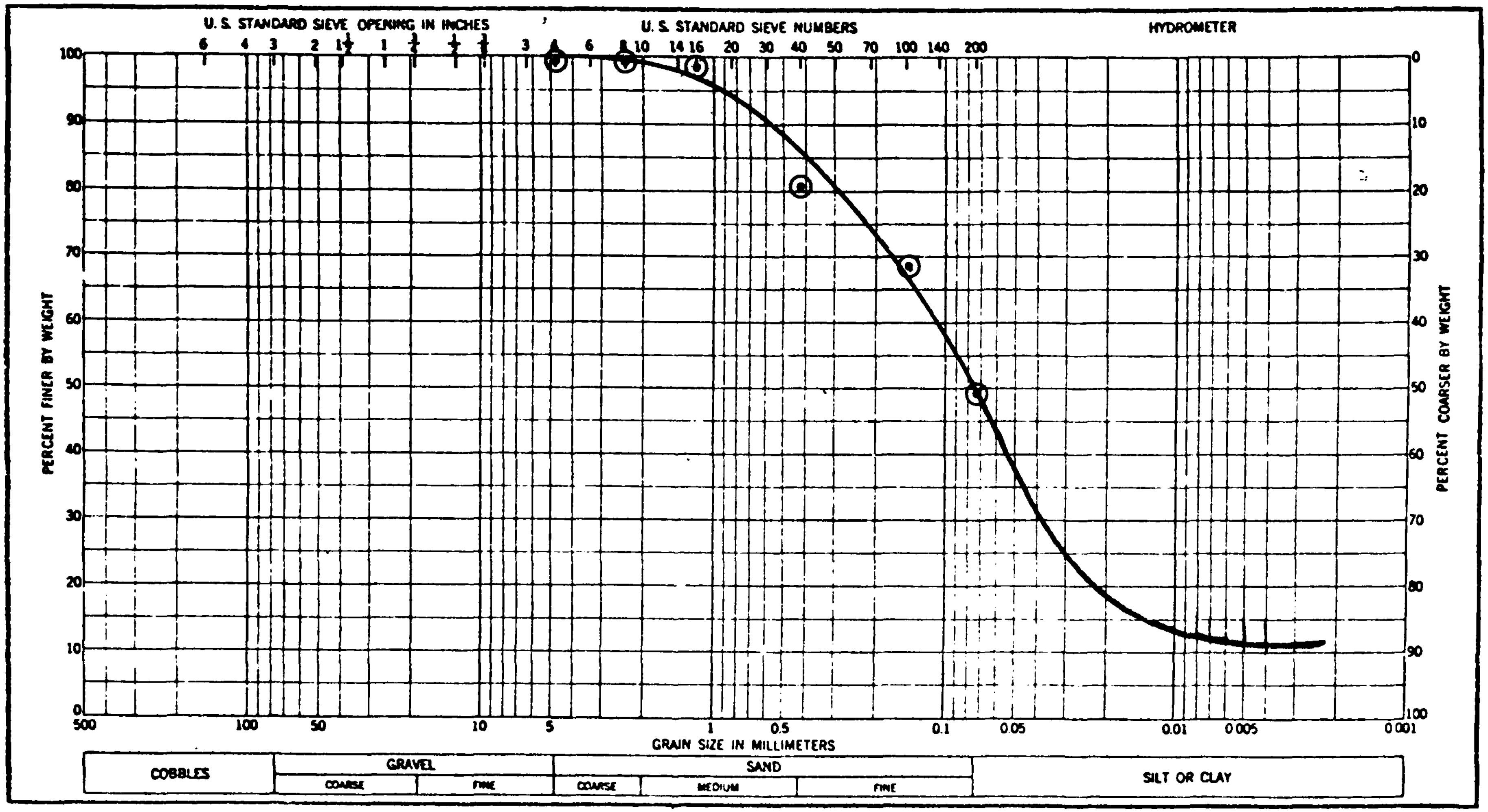


FIGURE I-9 . Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers , August, 1978, Station 9.

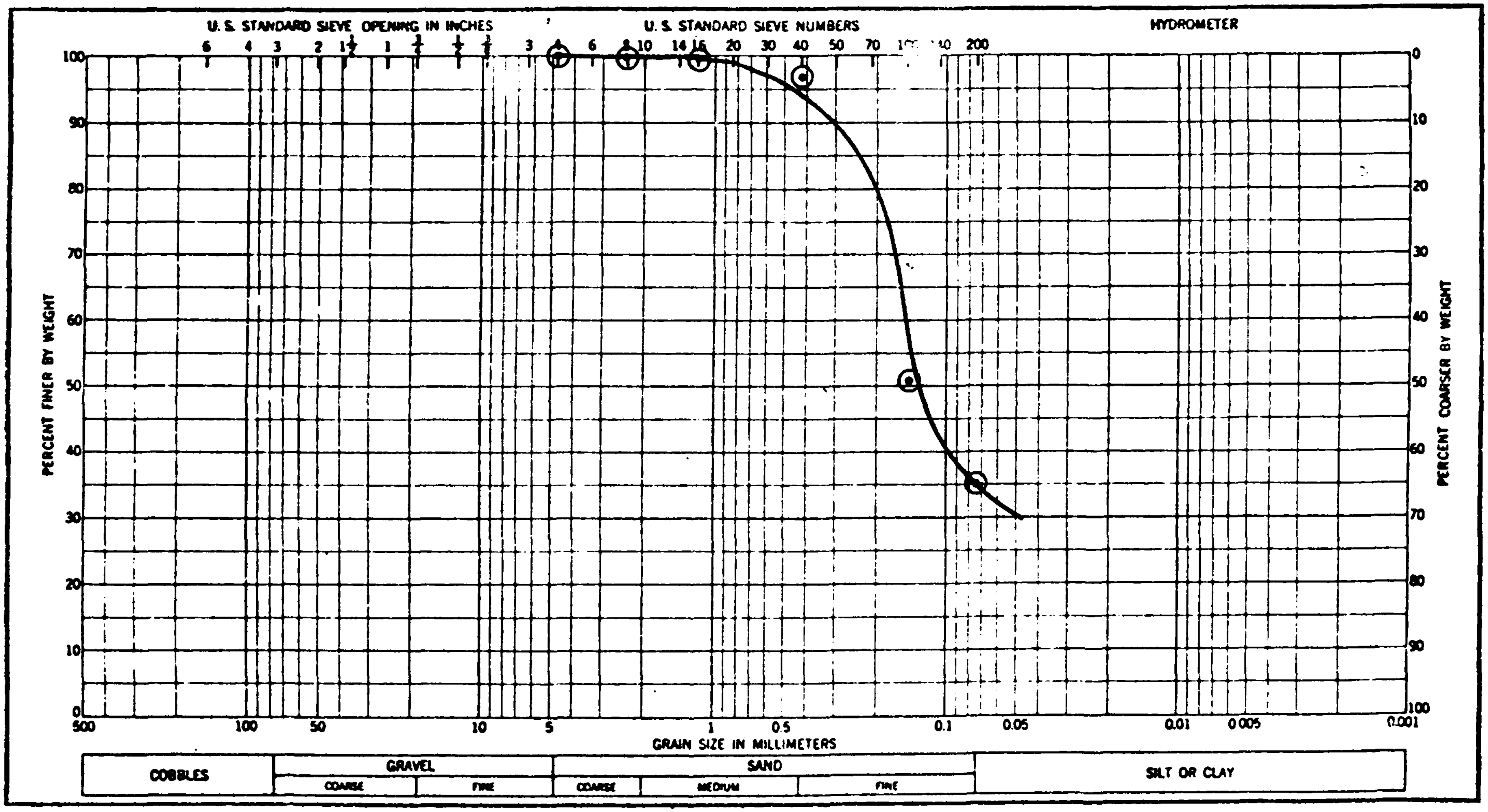


FIGURE I-10 . Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers , August, 1978, Station 10.

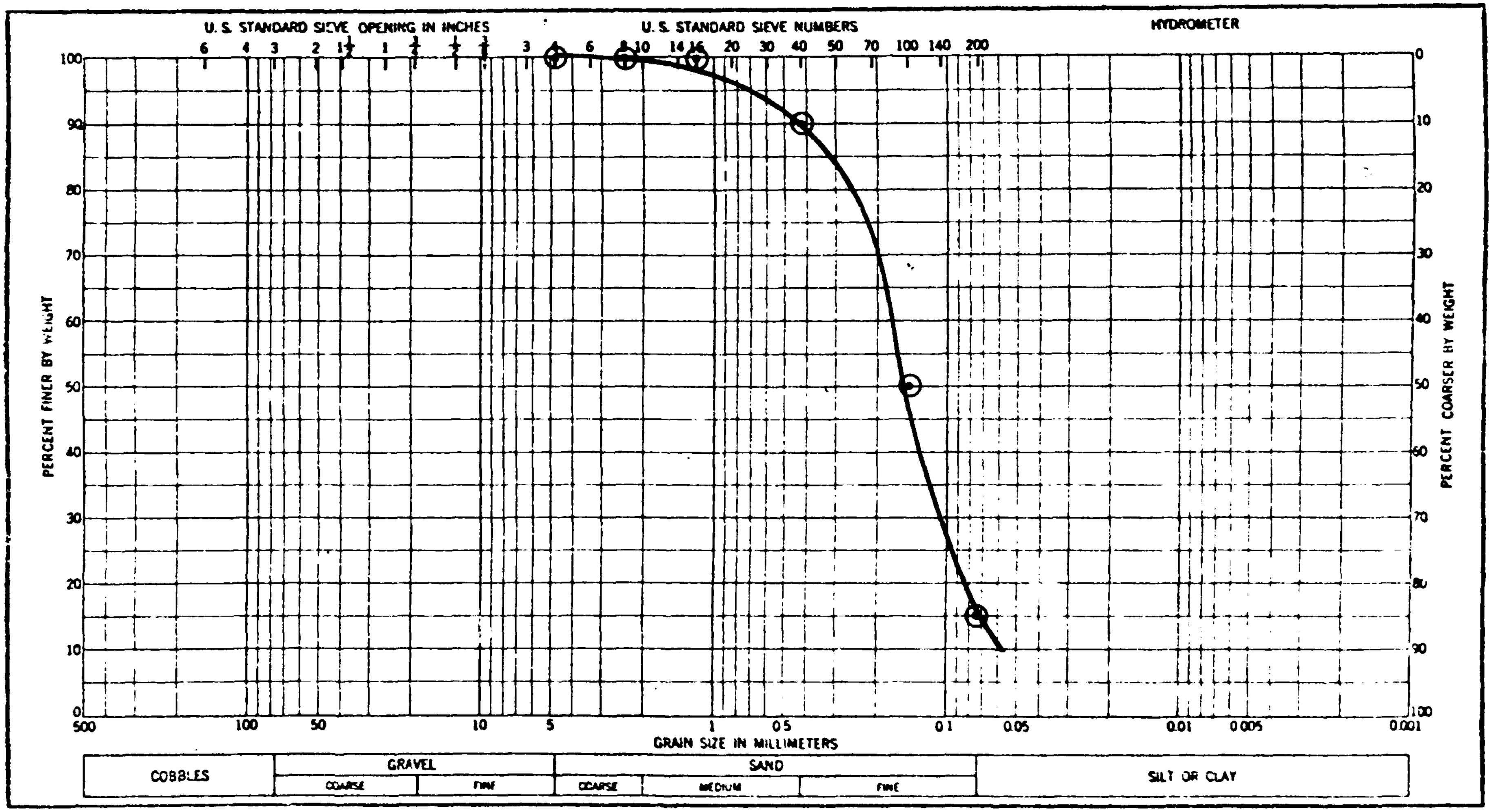


FIGURE I-11. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 12.

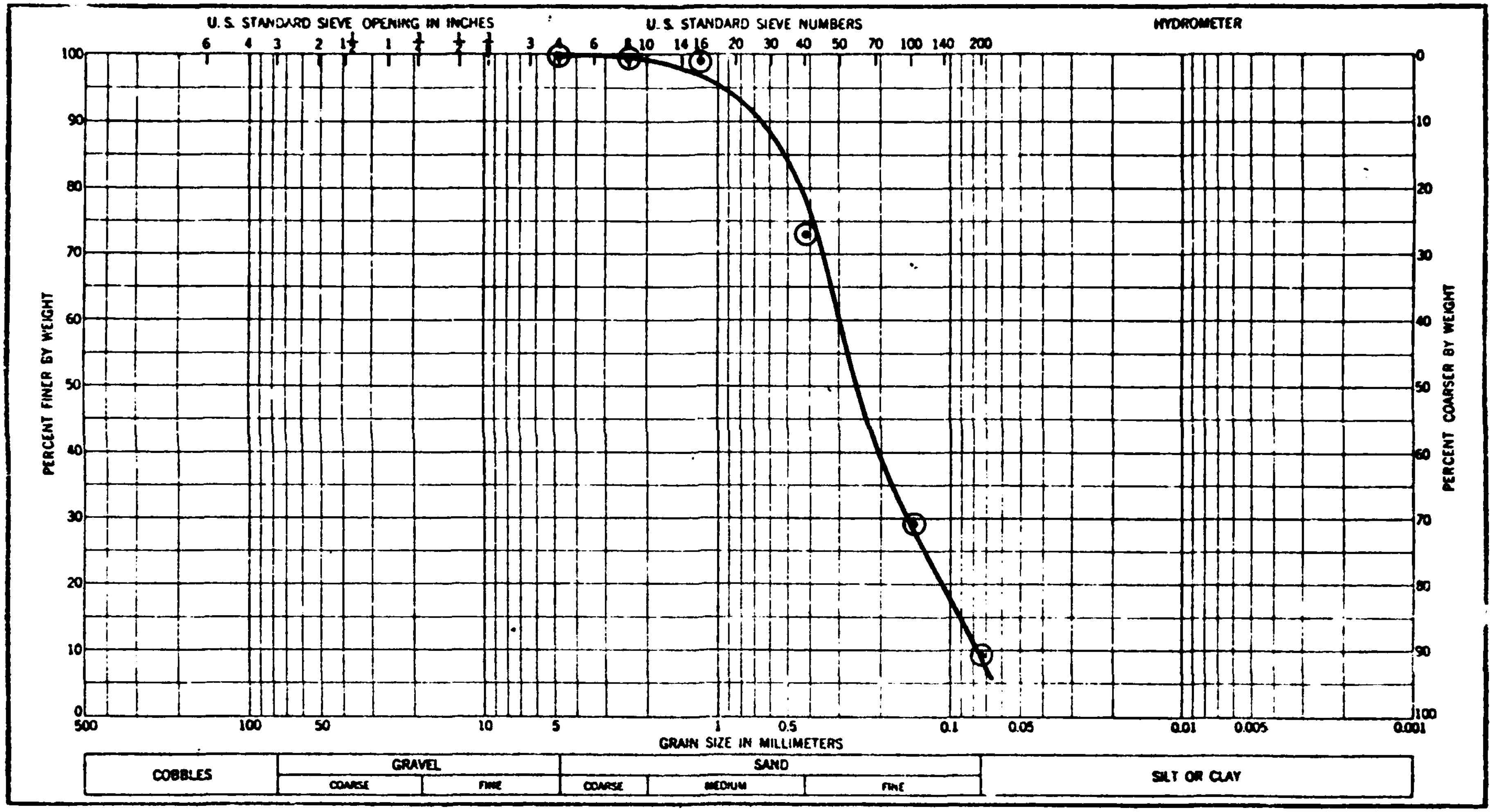


FIGURE I-12. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 13.

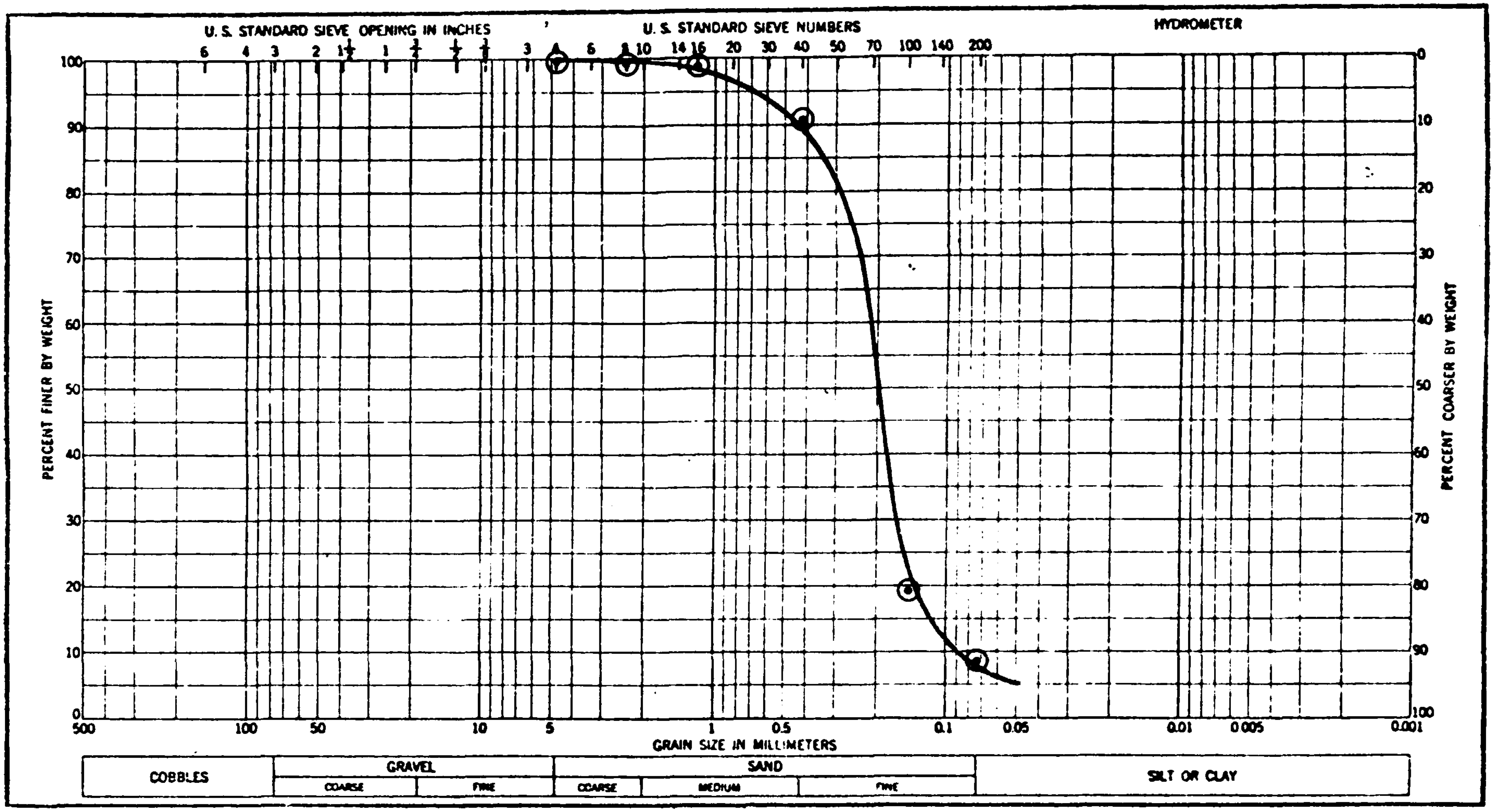


FIGURE I-13. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 14.

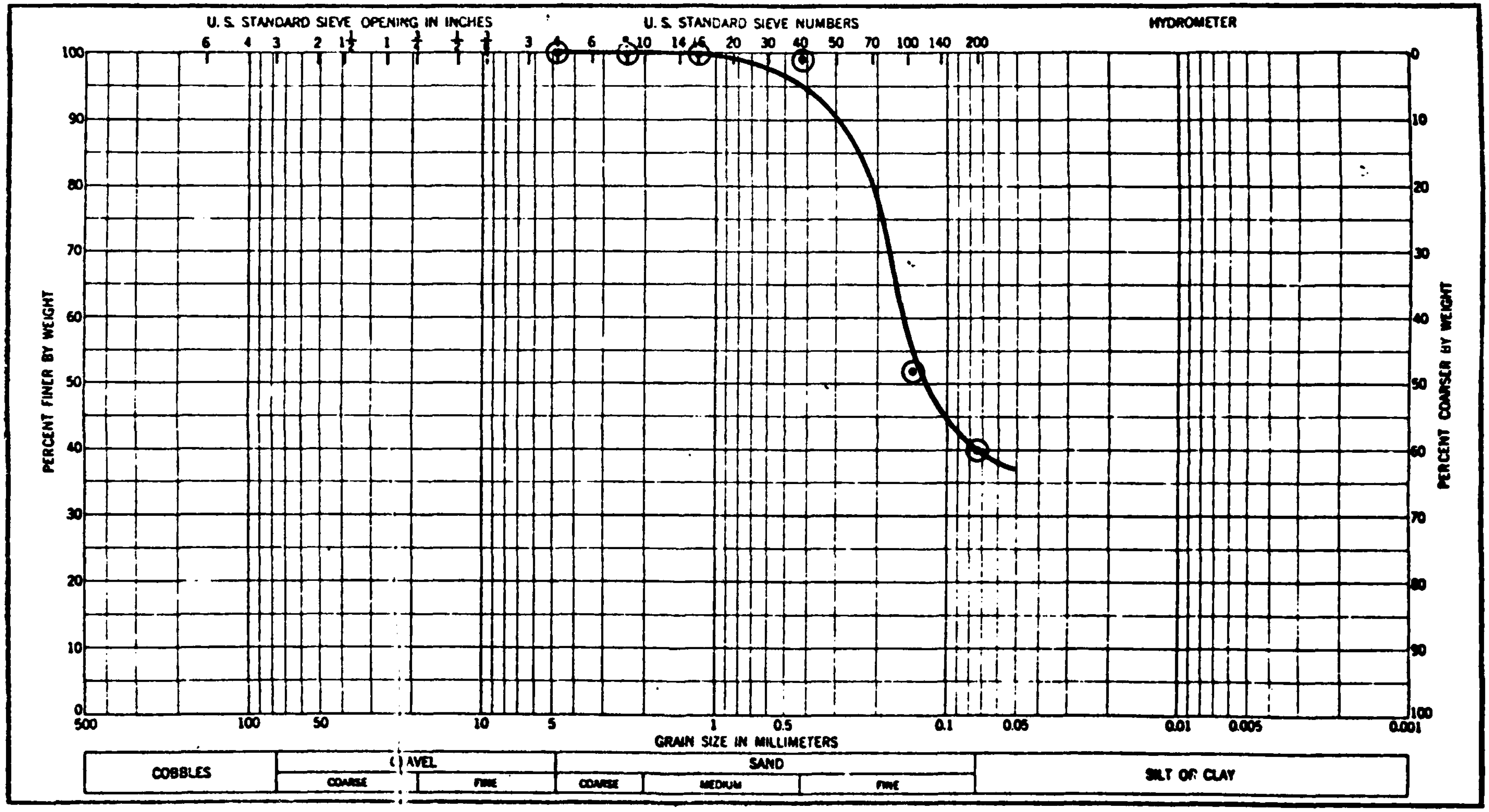


FIGURE I-14. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 15.

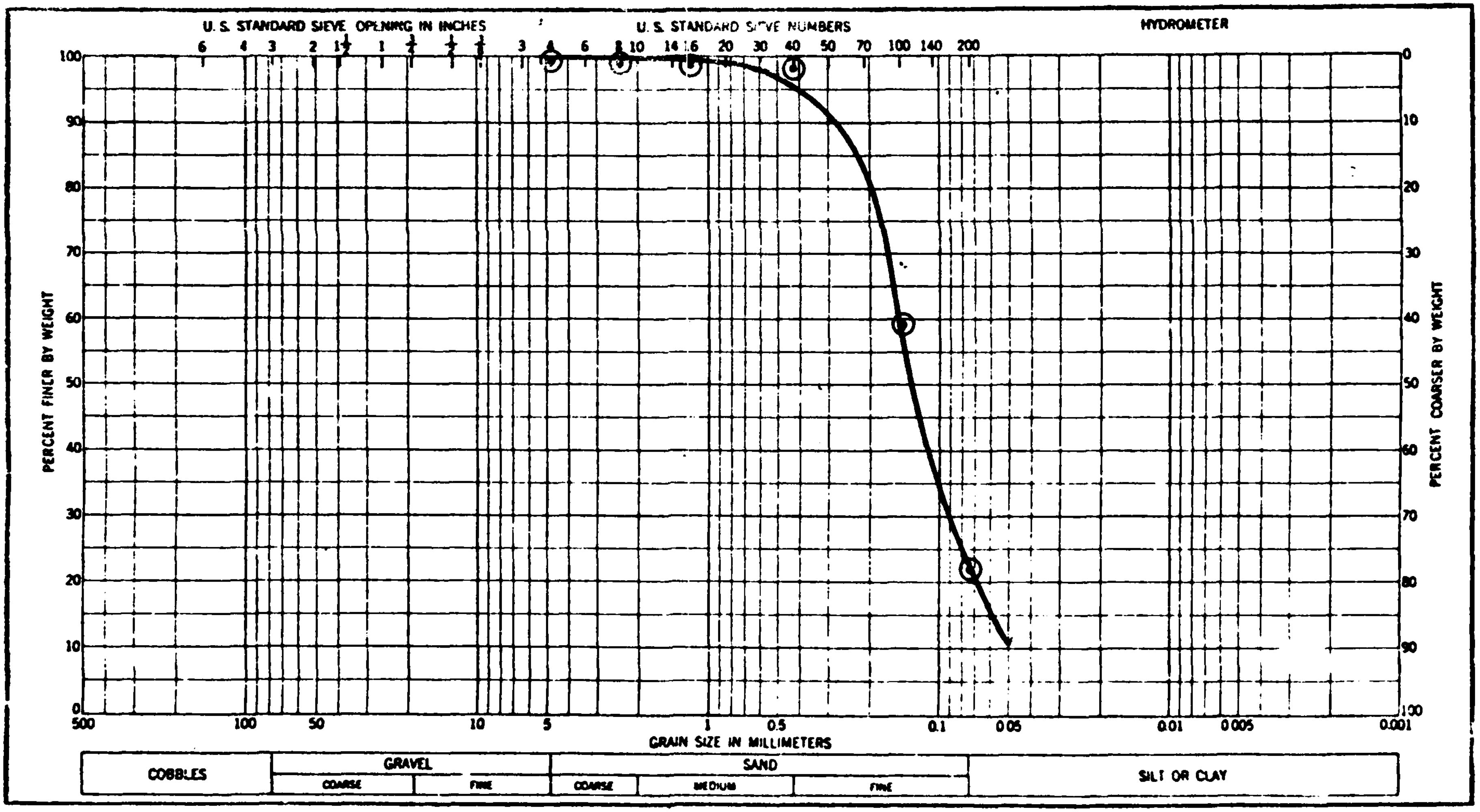


FIGURE I-15. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 16.

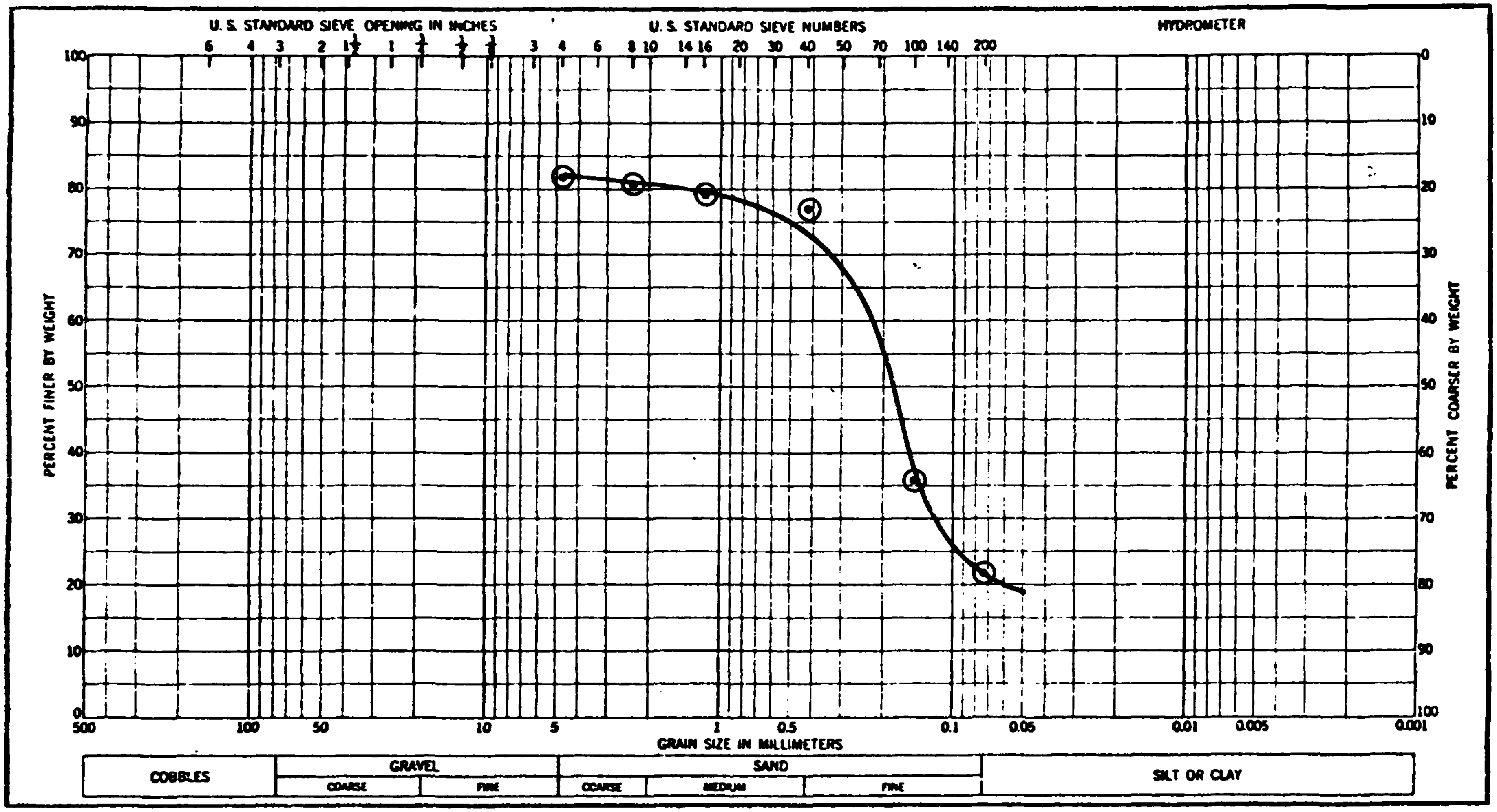


FIGURE I-16. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 17.

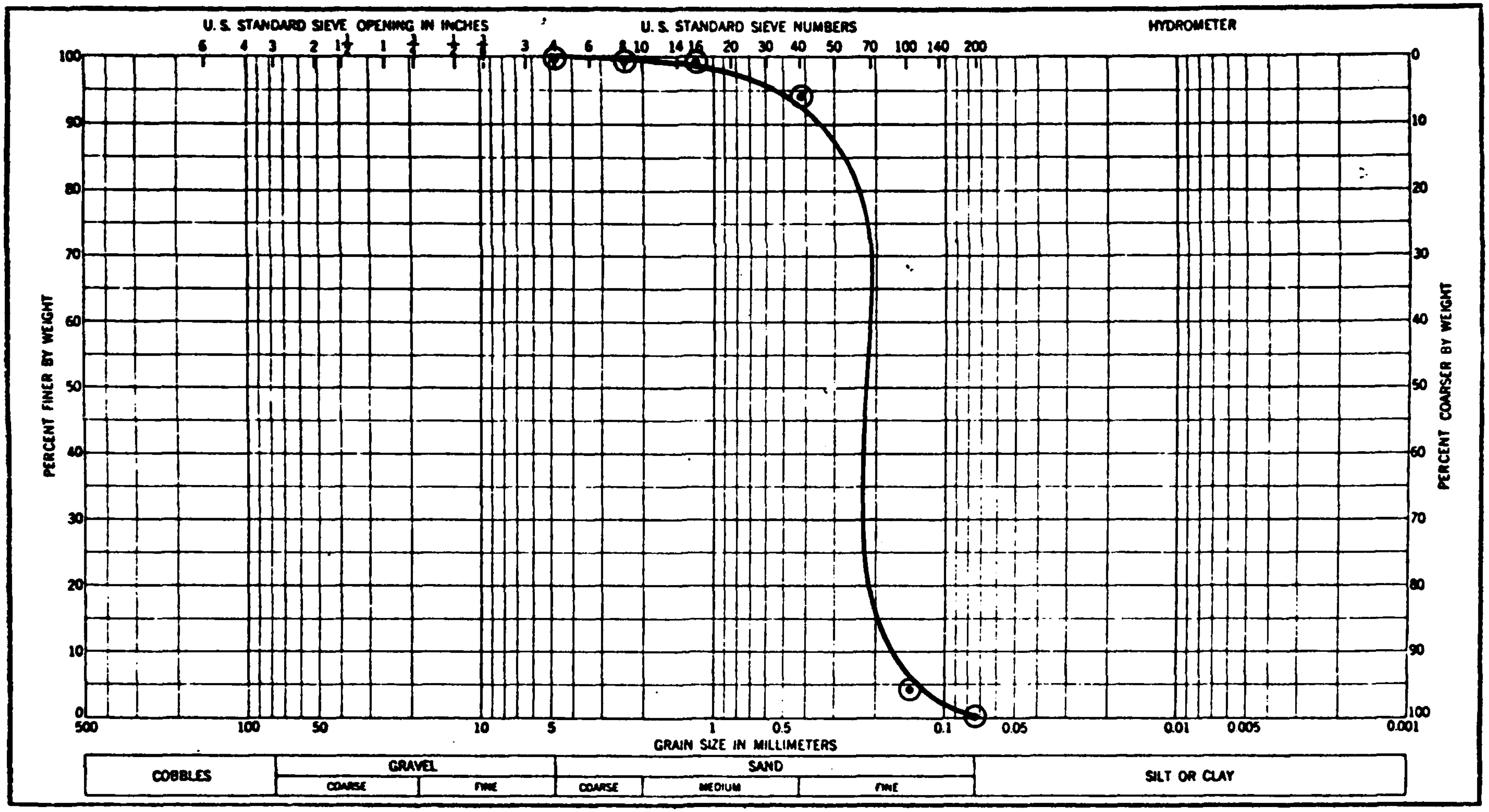


FIGURE I-17. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 18.

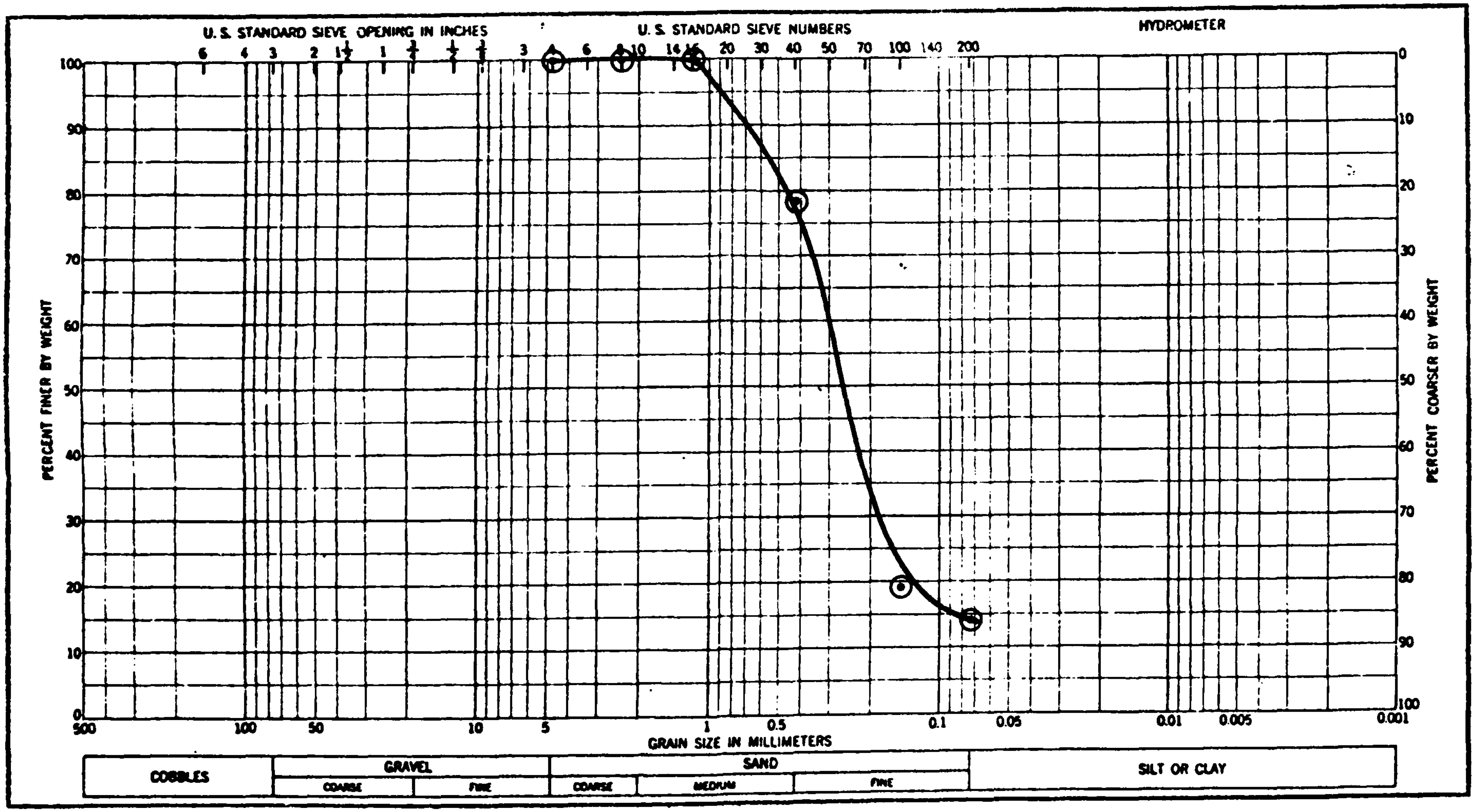


FIGURE I-18. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 19.

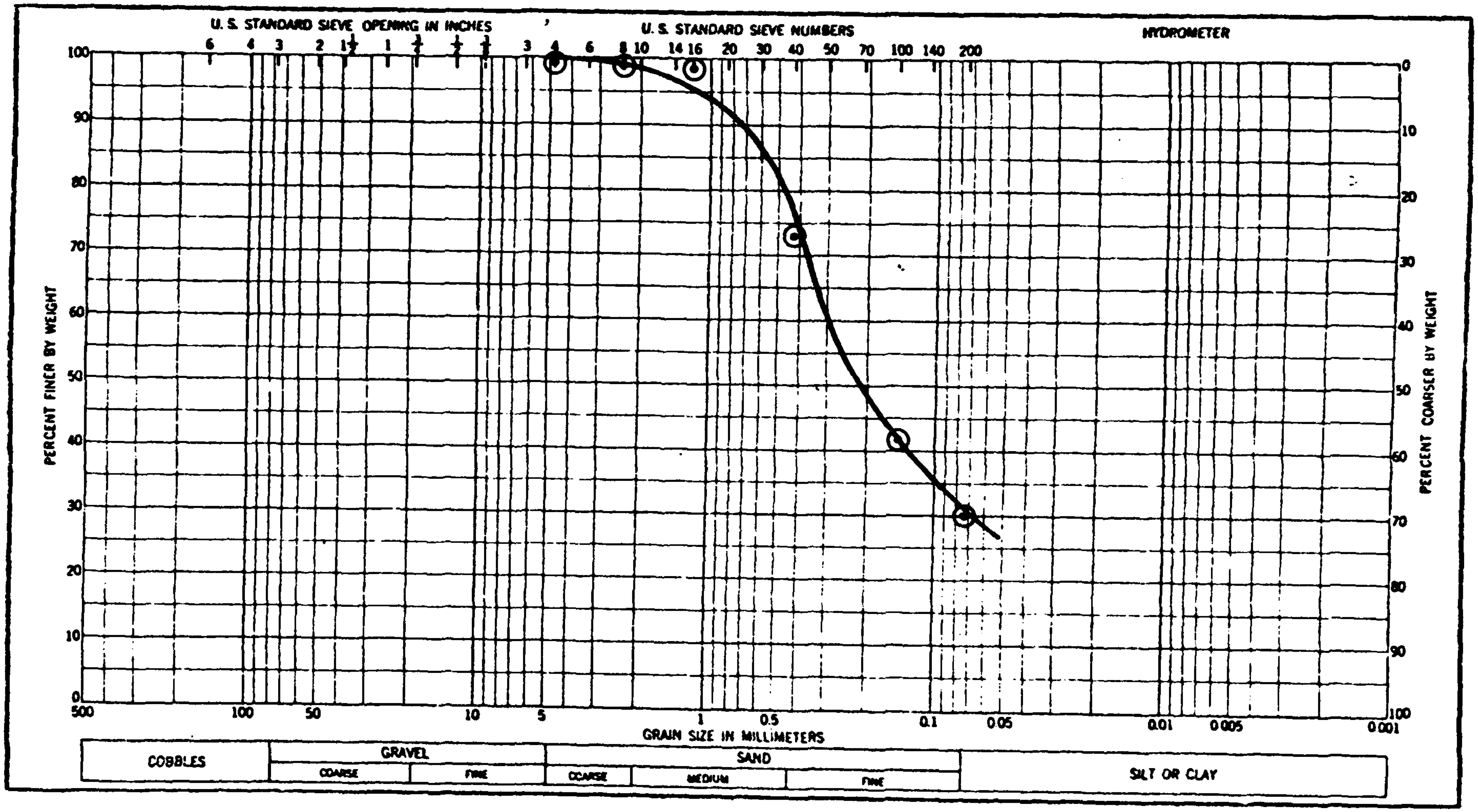


FIGURE I-19. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 2C.

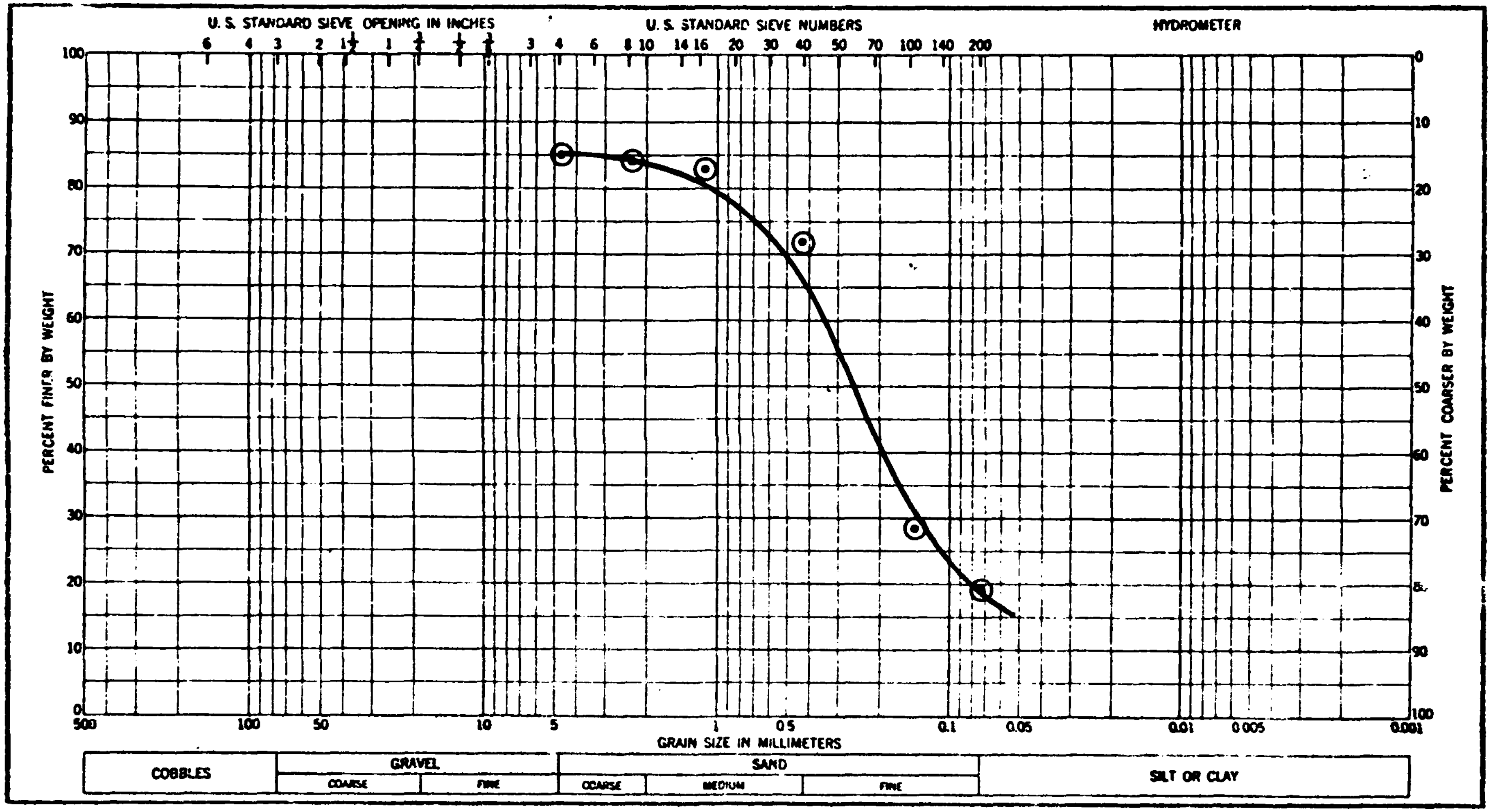


FIGURE I-20. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 21.

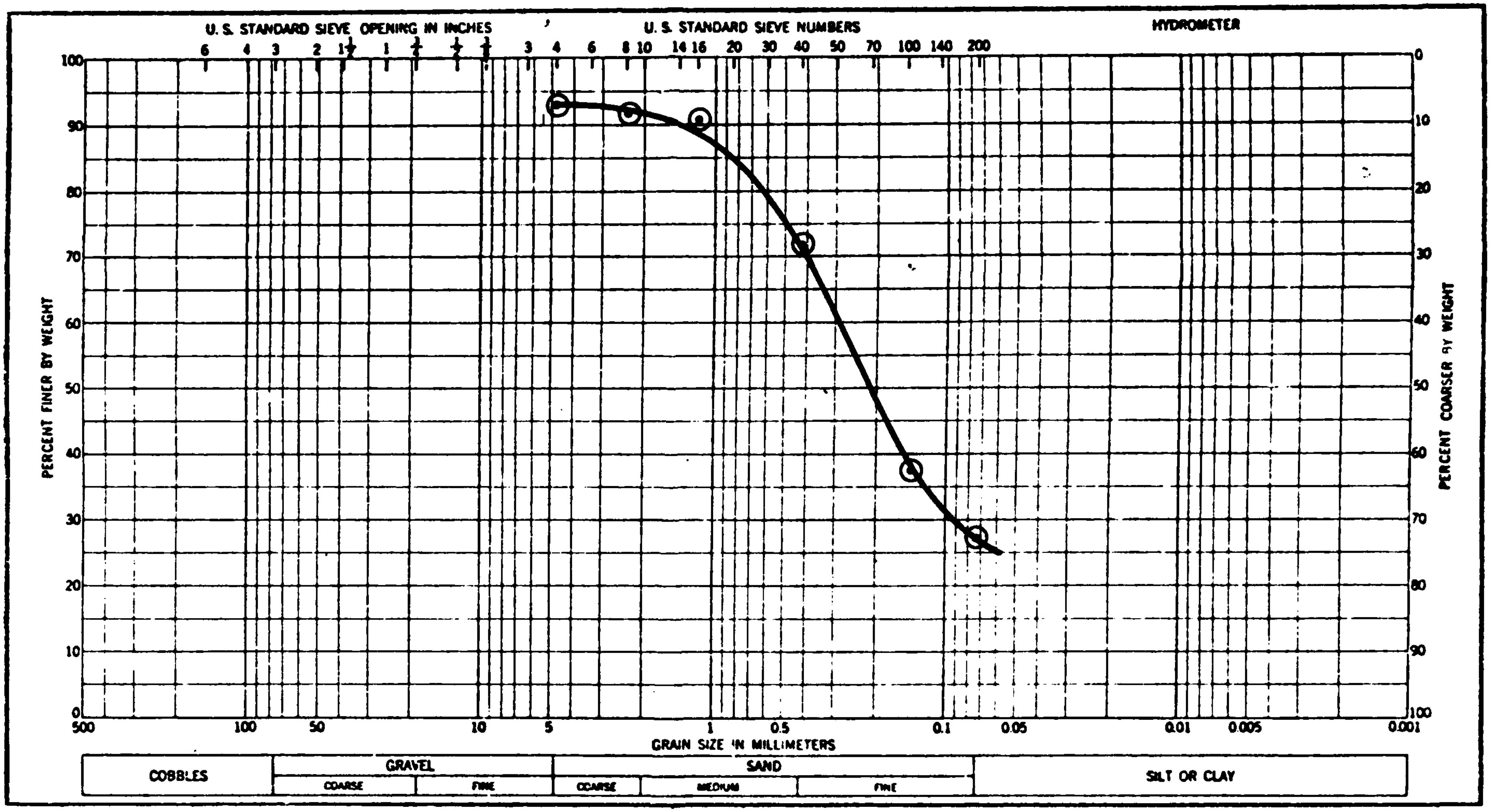


FIGURE I-21 . Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 22.

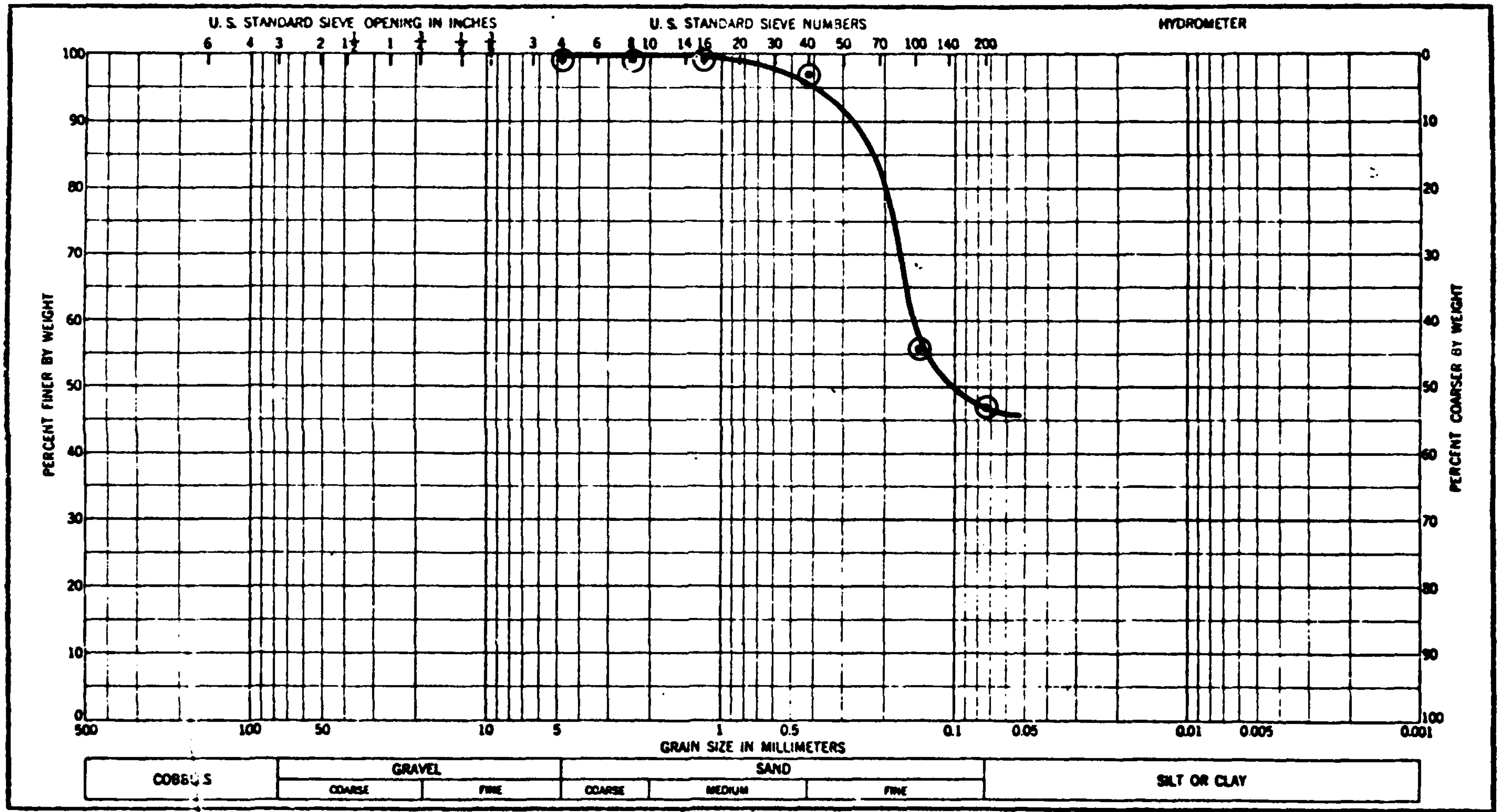


FIGURE I-22. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1978, Station 23.

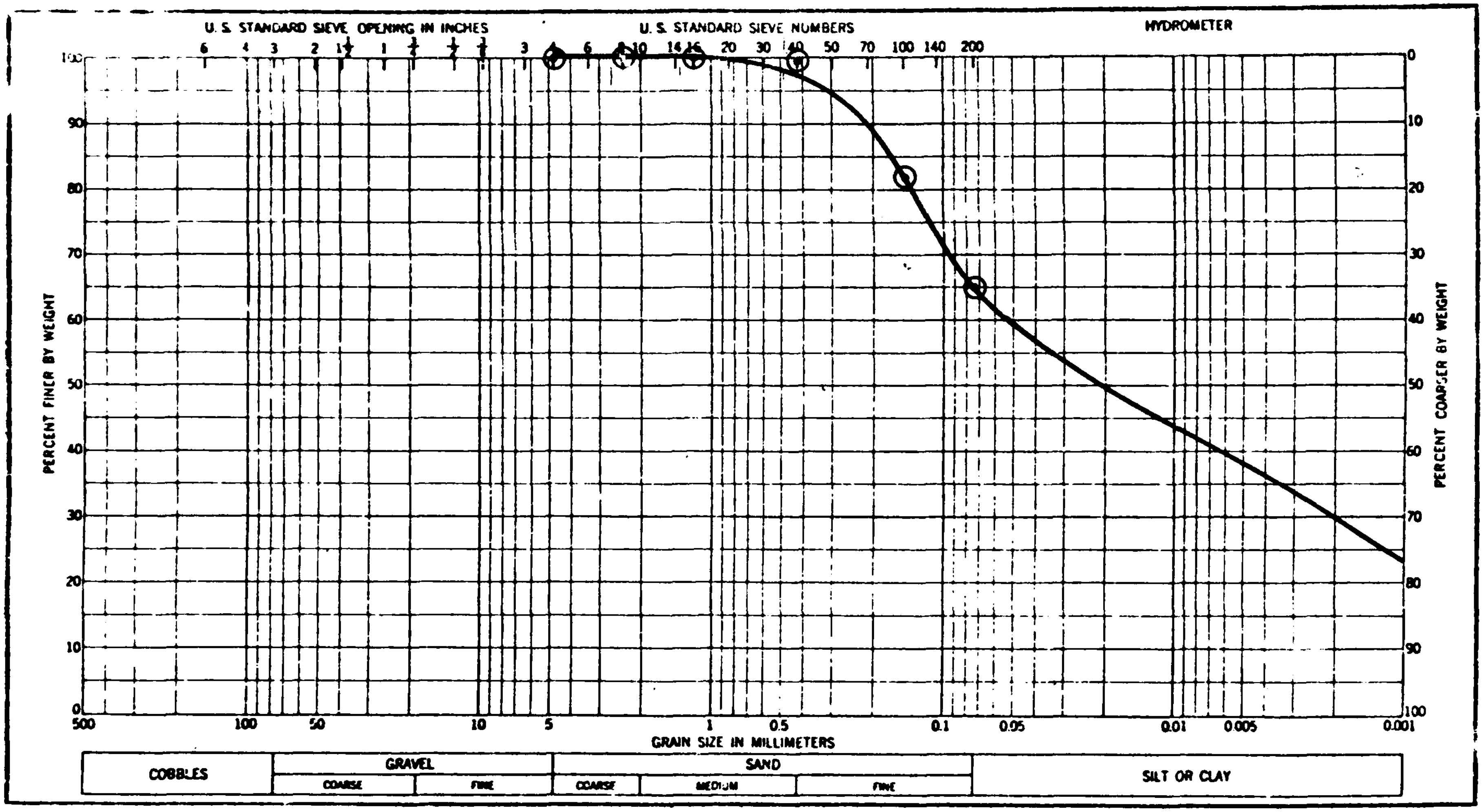


FIGURE I-23. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 1.

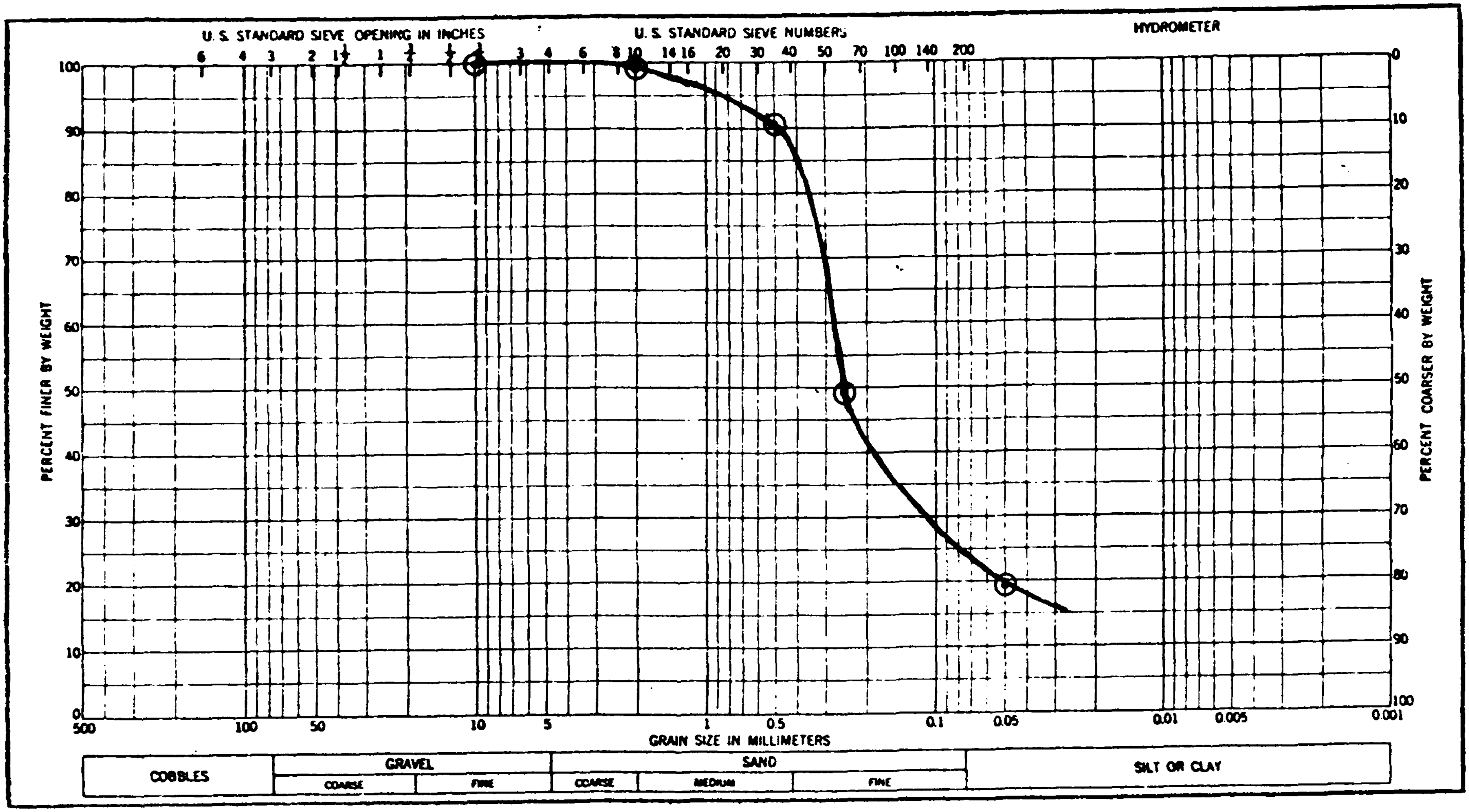


FIGURE I-24 . Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 2.

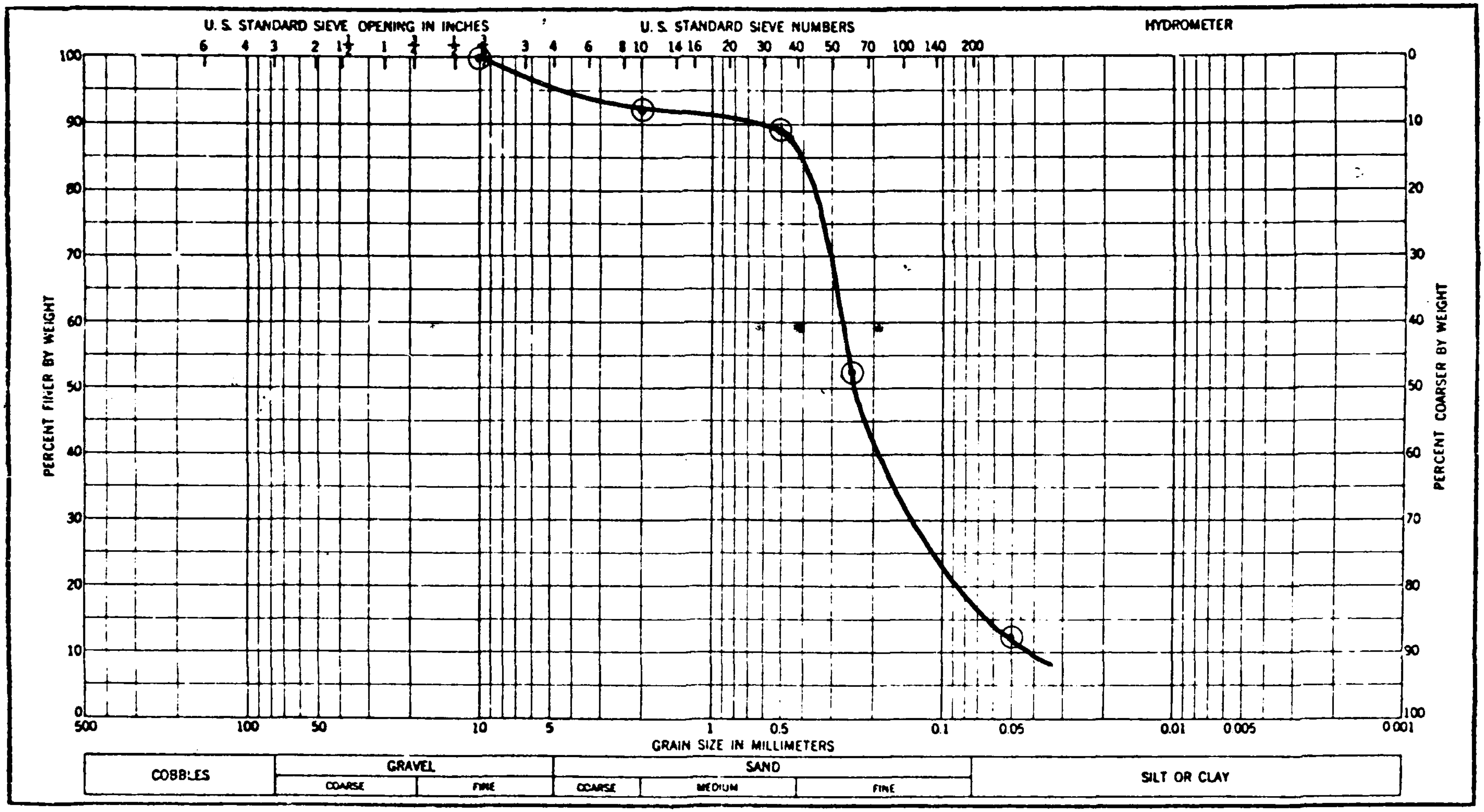


FIGURE I-25 . Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers , August, 1979 , Station 3.

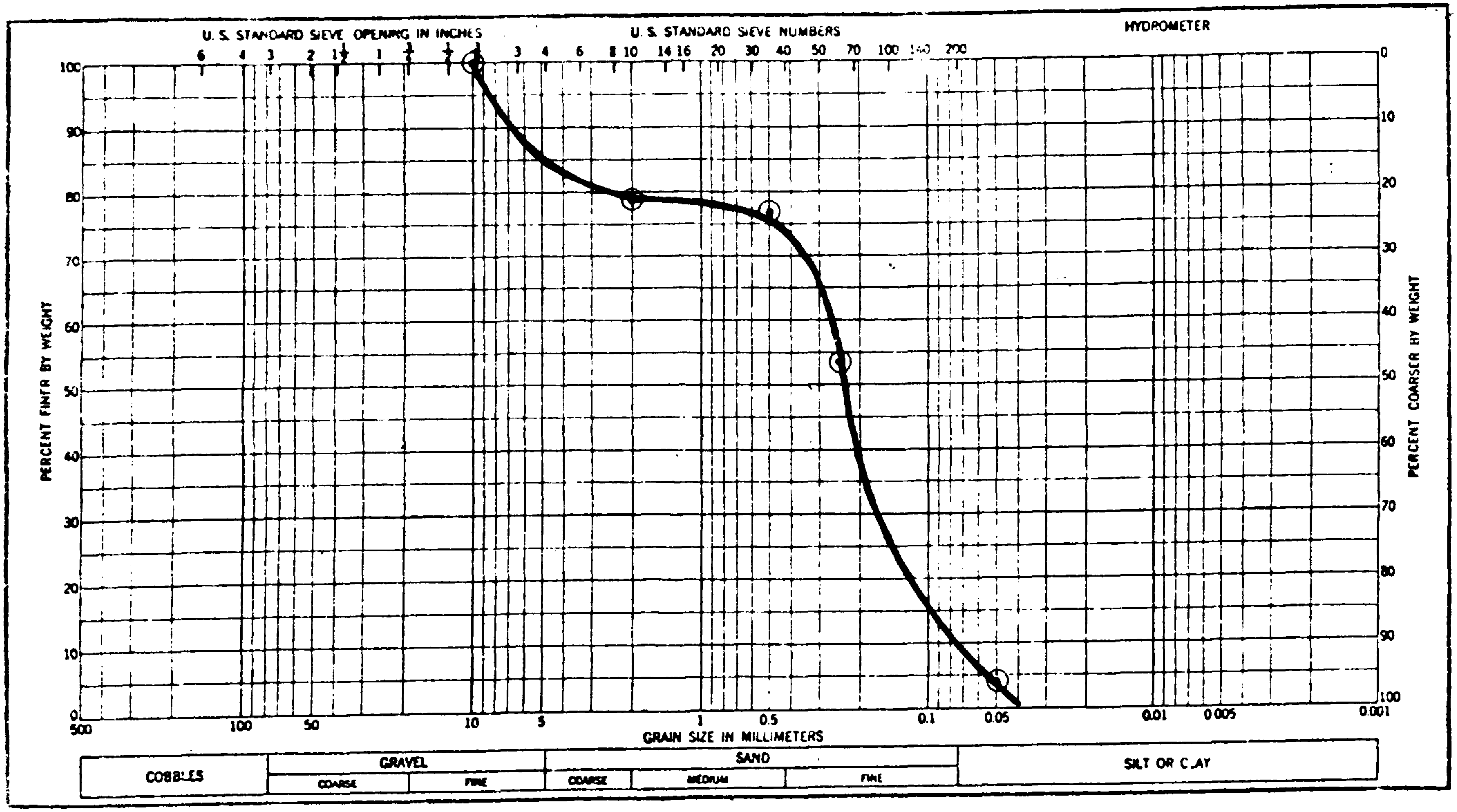


FIGURE I-26 . Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers , August, 1979 , Station 4 .

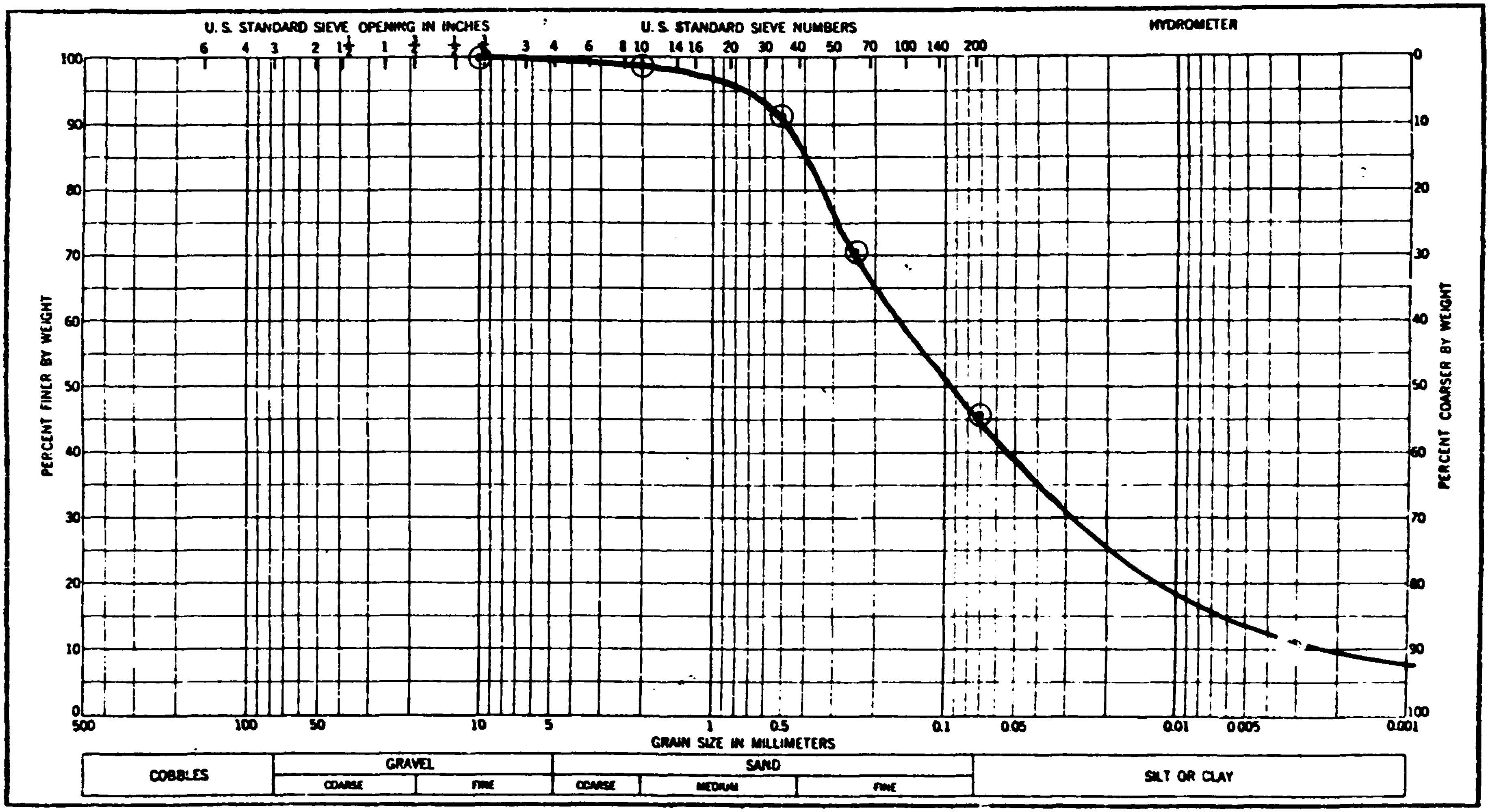


FIGURE I-27 . Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers , August, 1979, Station 5.

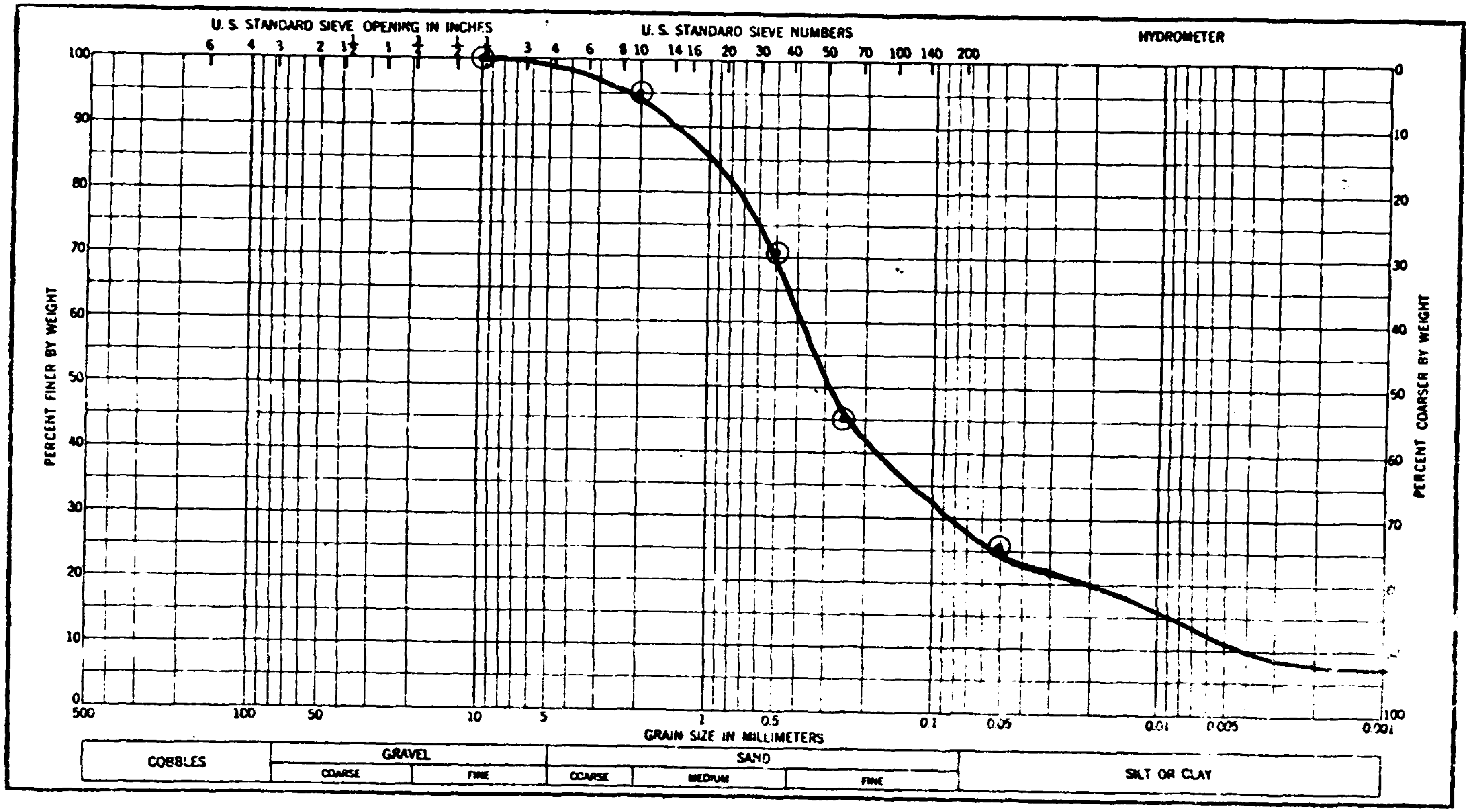


FIGURE I-28. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 6.

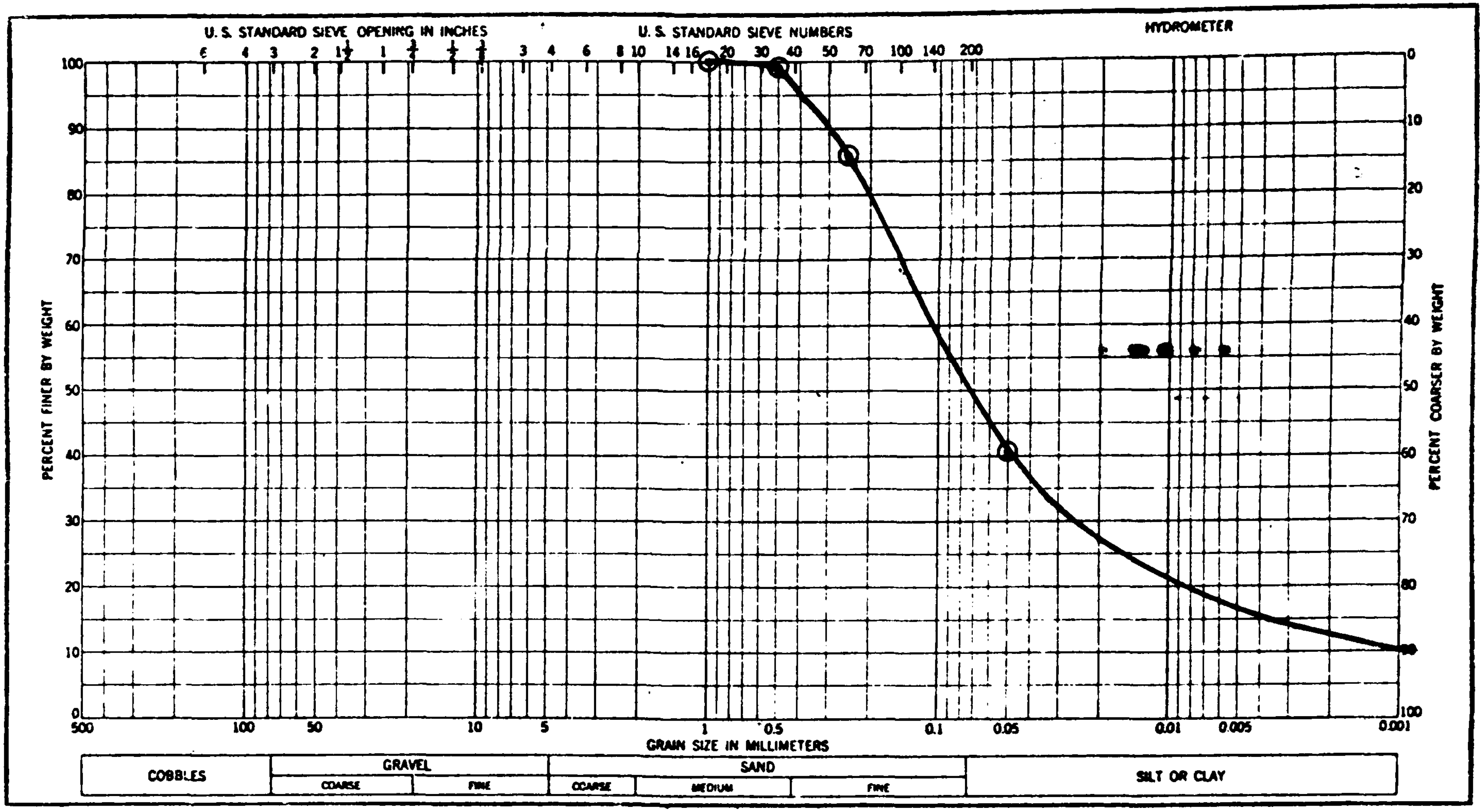


FIGURE I-29. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 7.

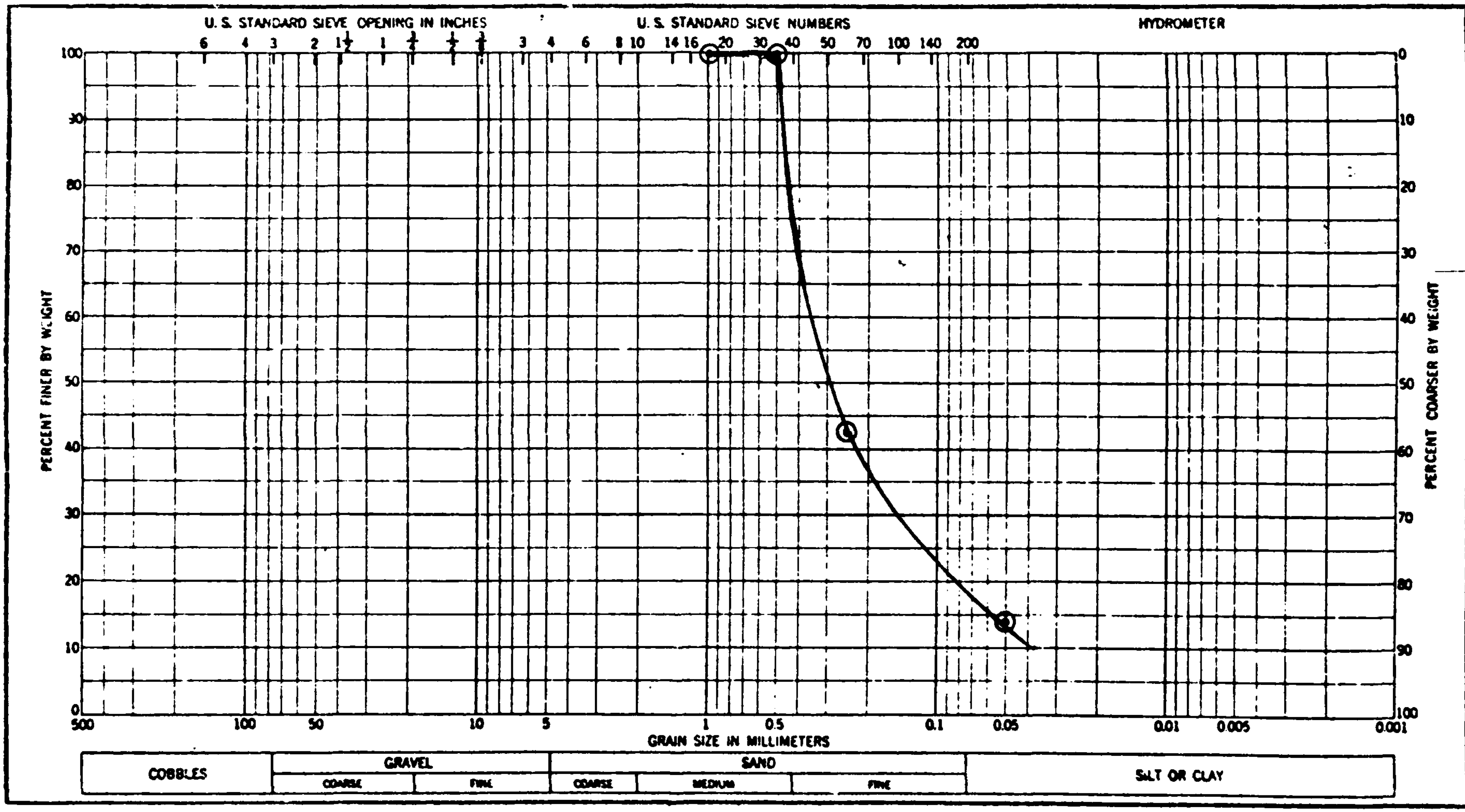


FIGURE I-30. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 8.

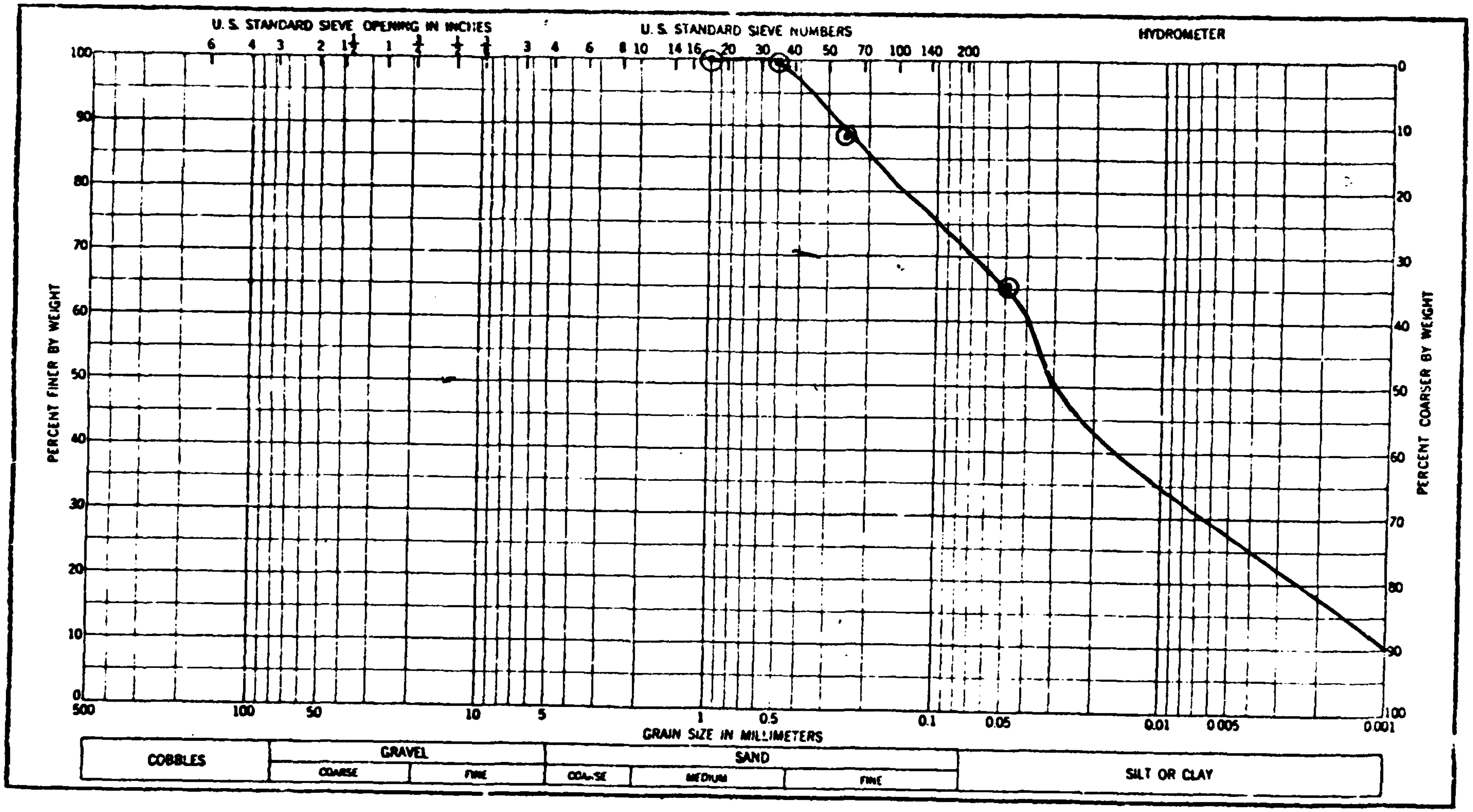


FIGURE I-31. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 9.

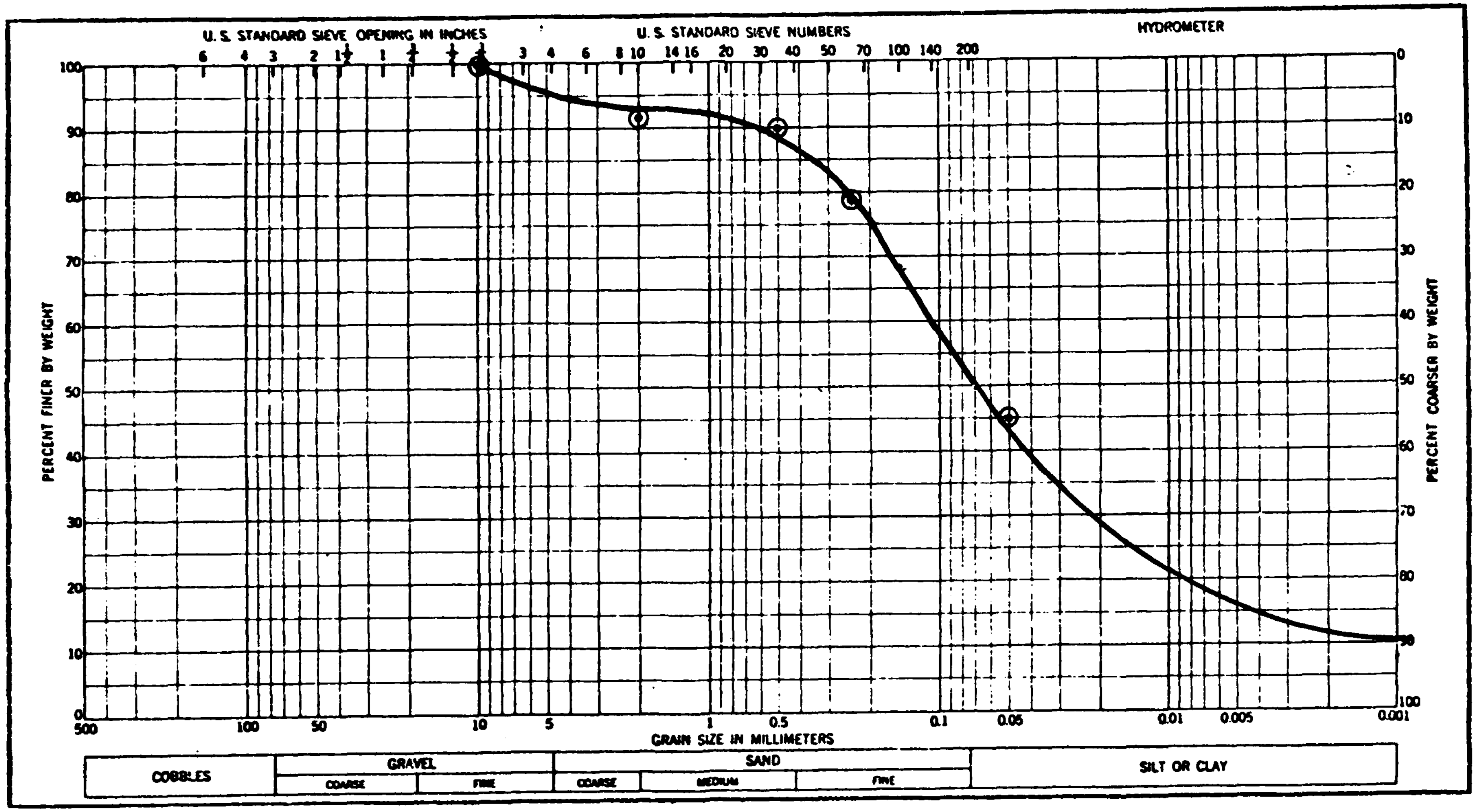


FIGURE I-32. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 10.

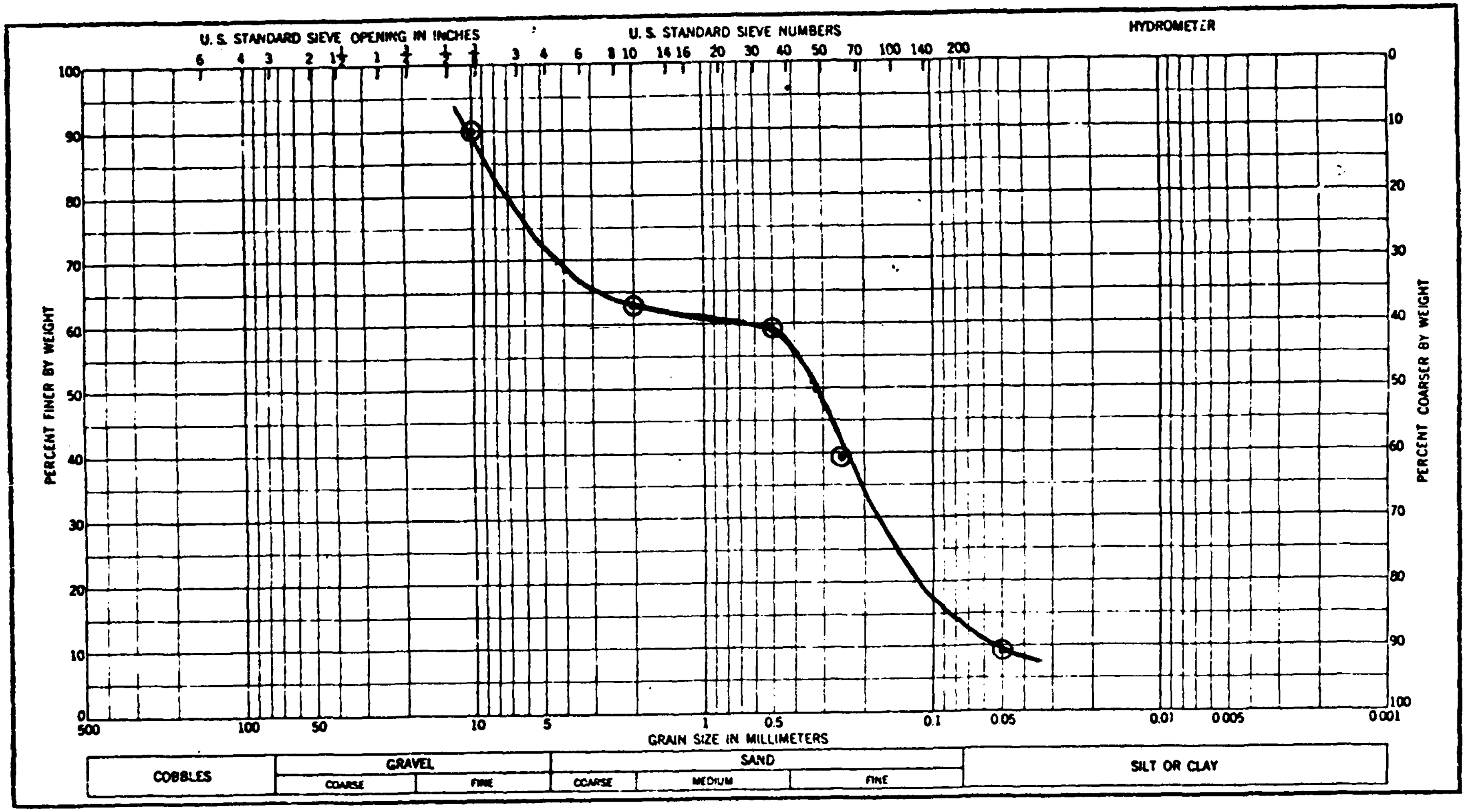


FIGURE I-33. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 12.

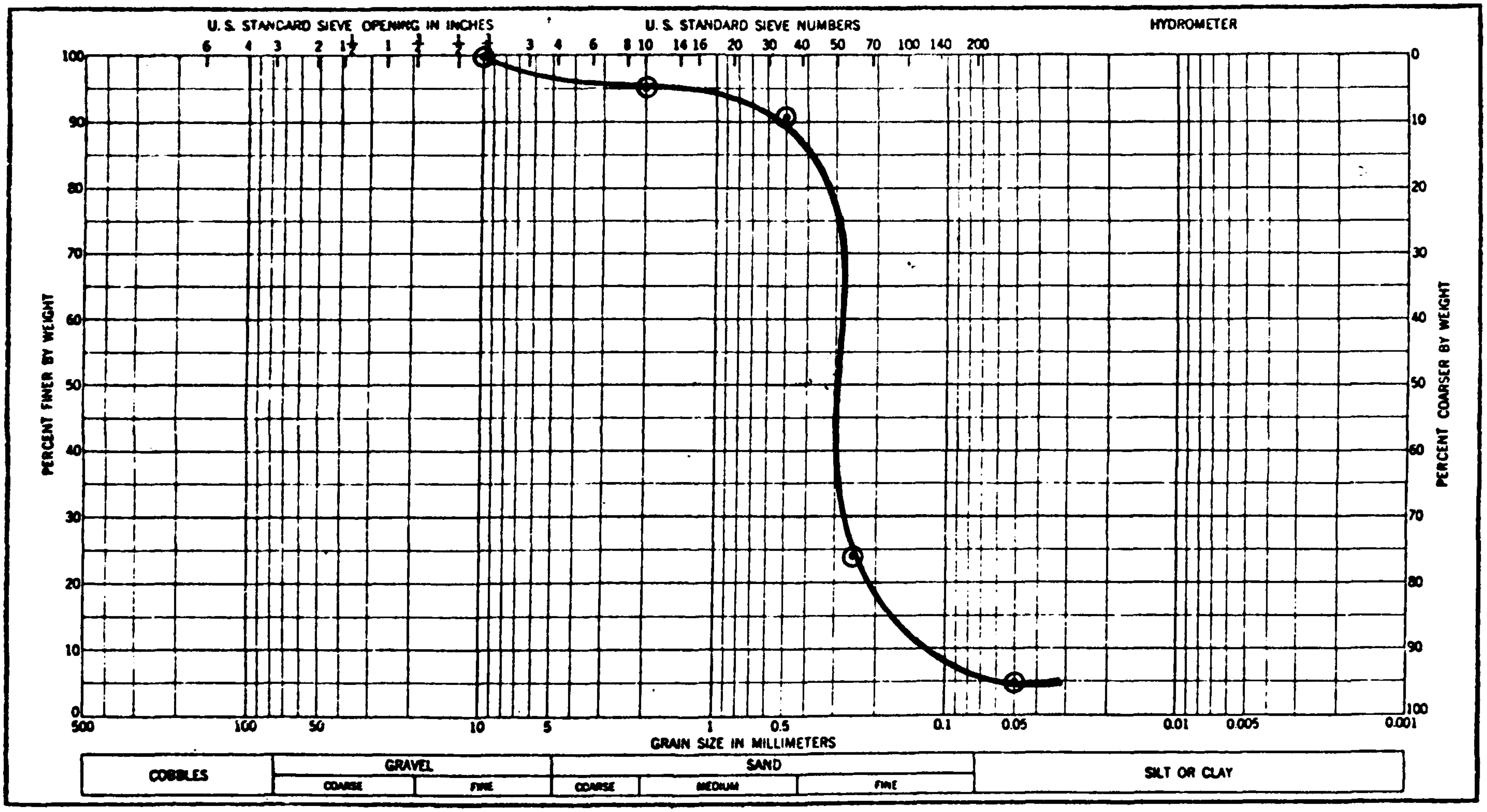


FIGURE I-34. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 13.

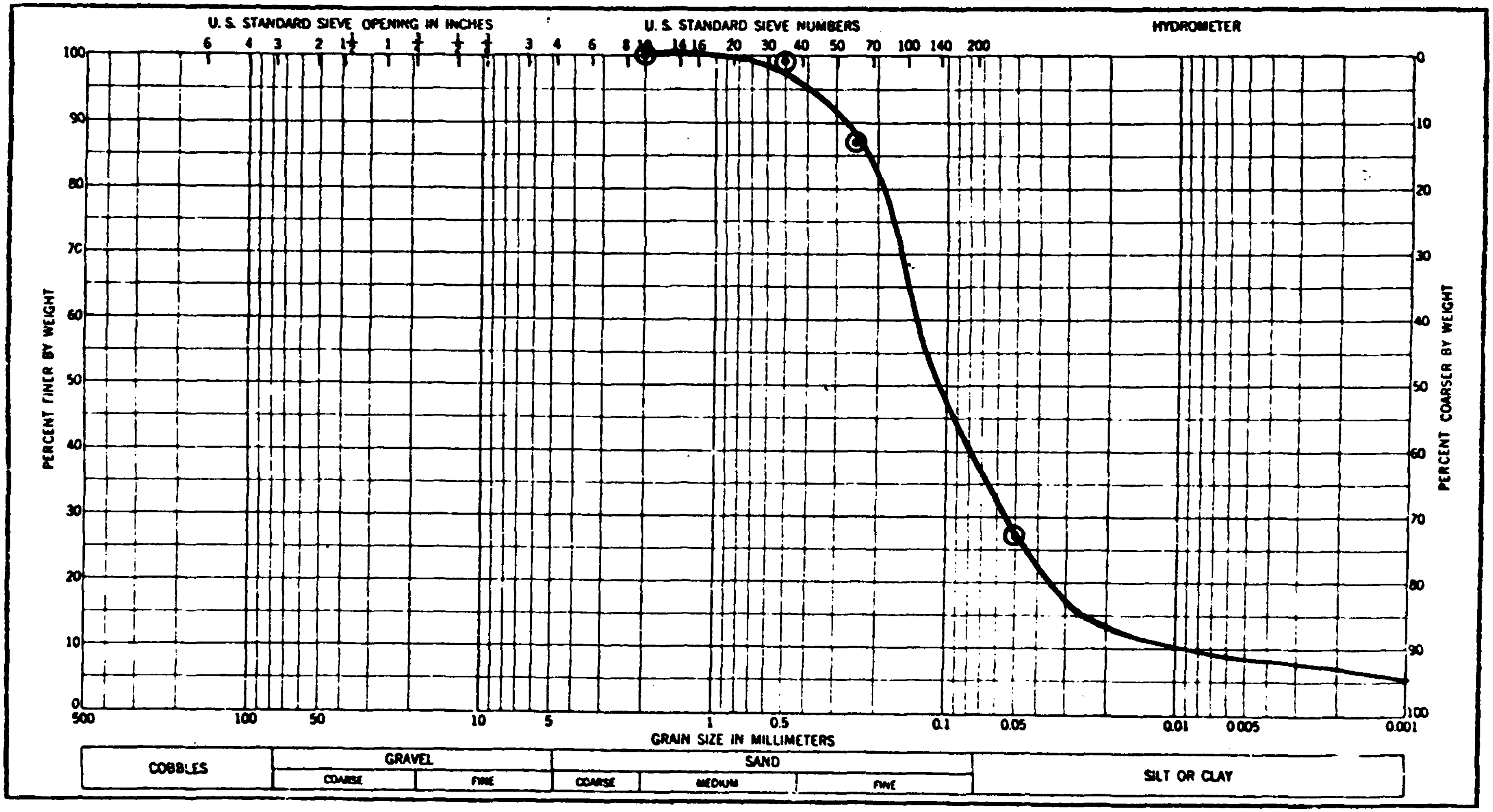


FIGURE I-35. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 14.

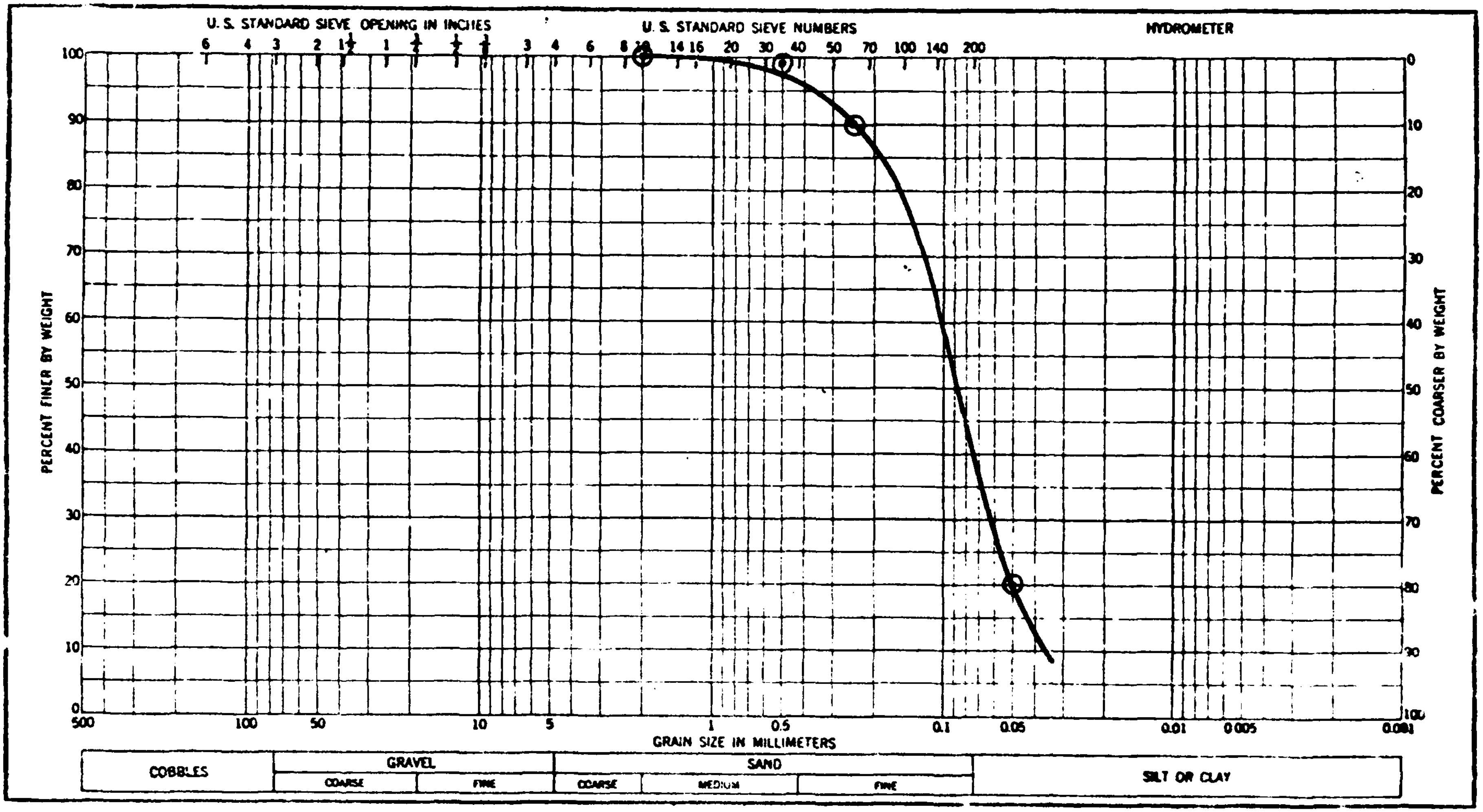


FIGURE I-36 . Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 15.

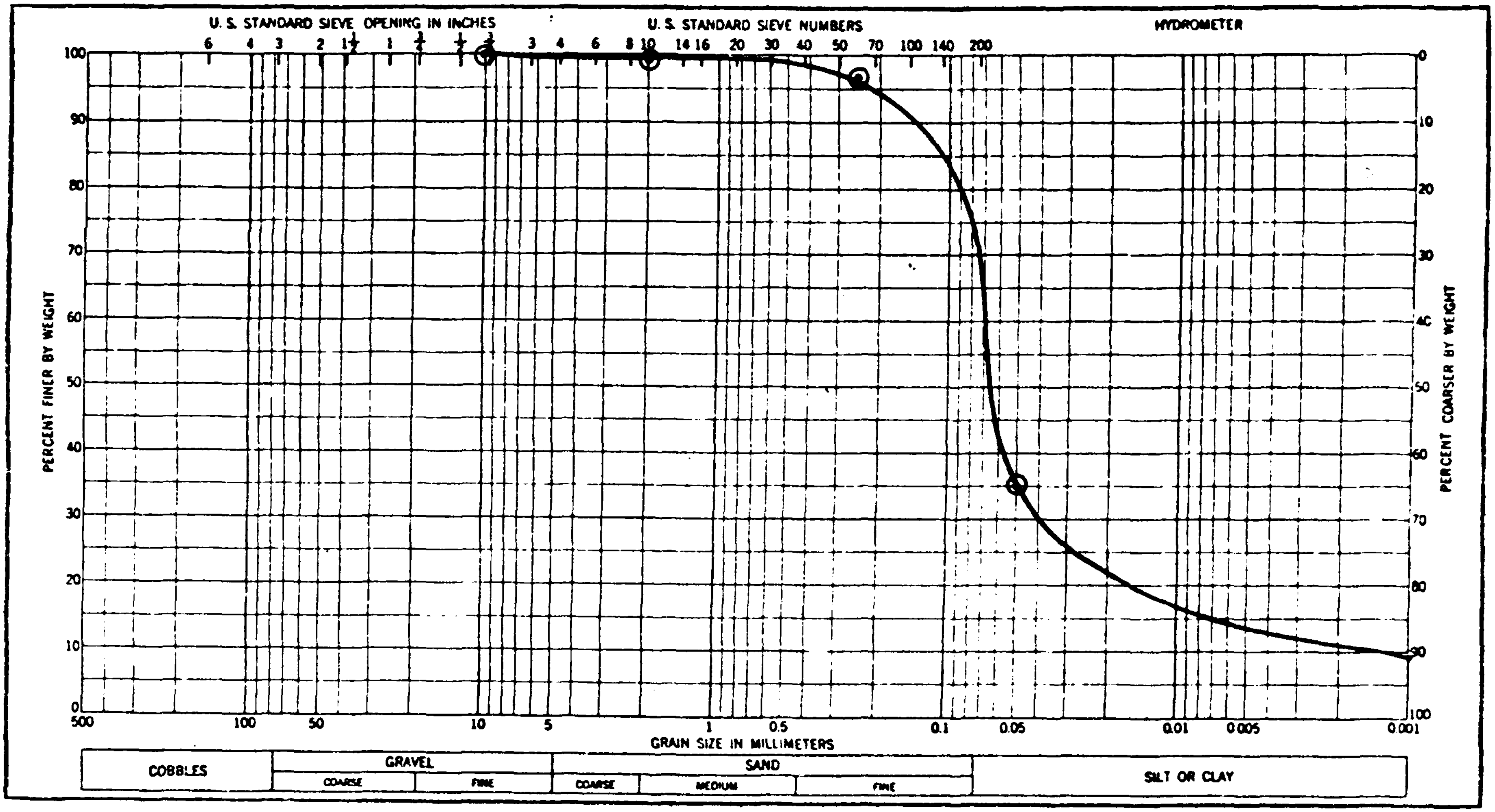


FIGURE I-37. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 16.

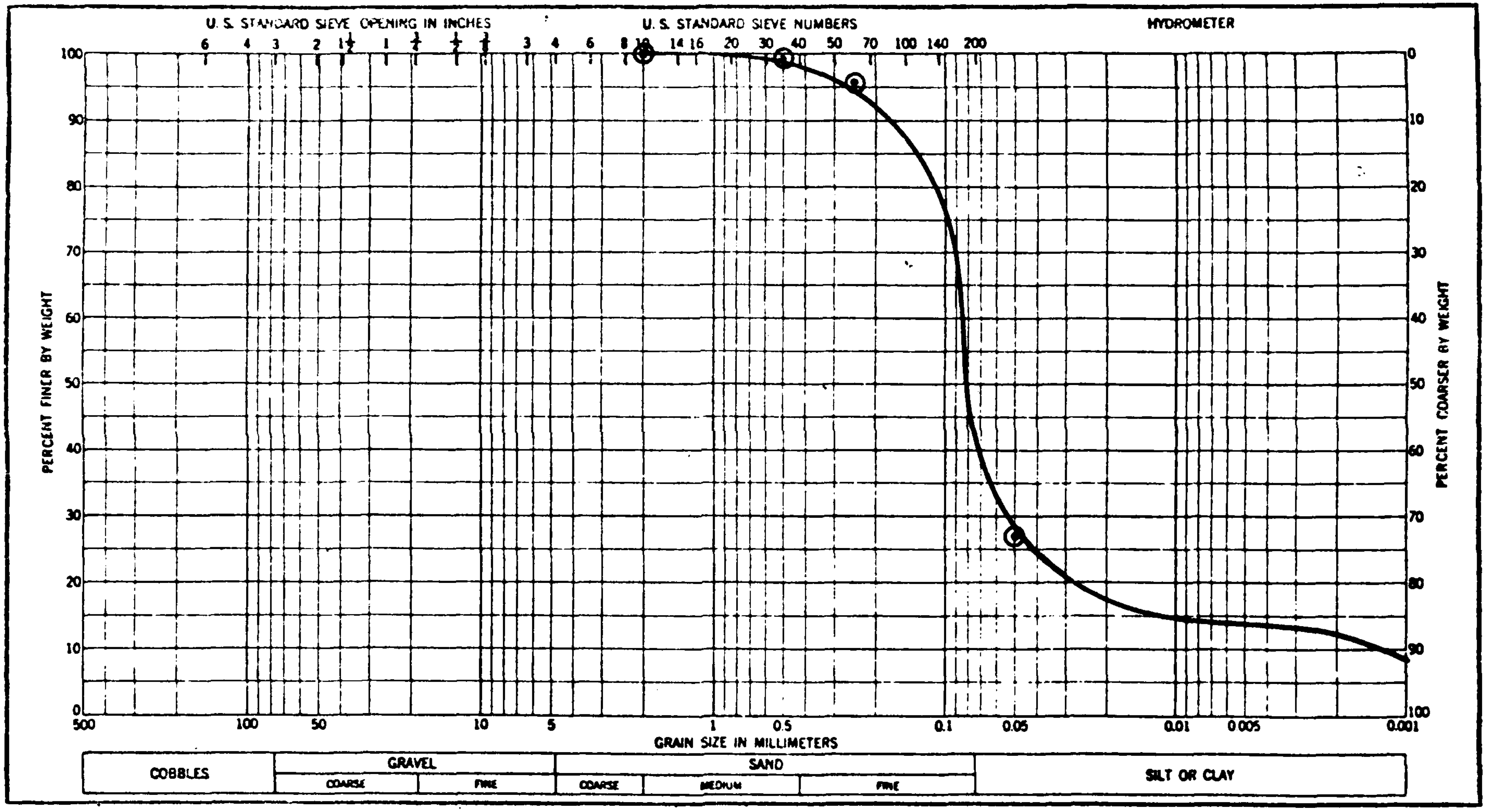


FIGURE I-38. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 17.

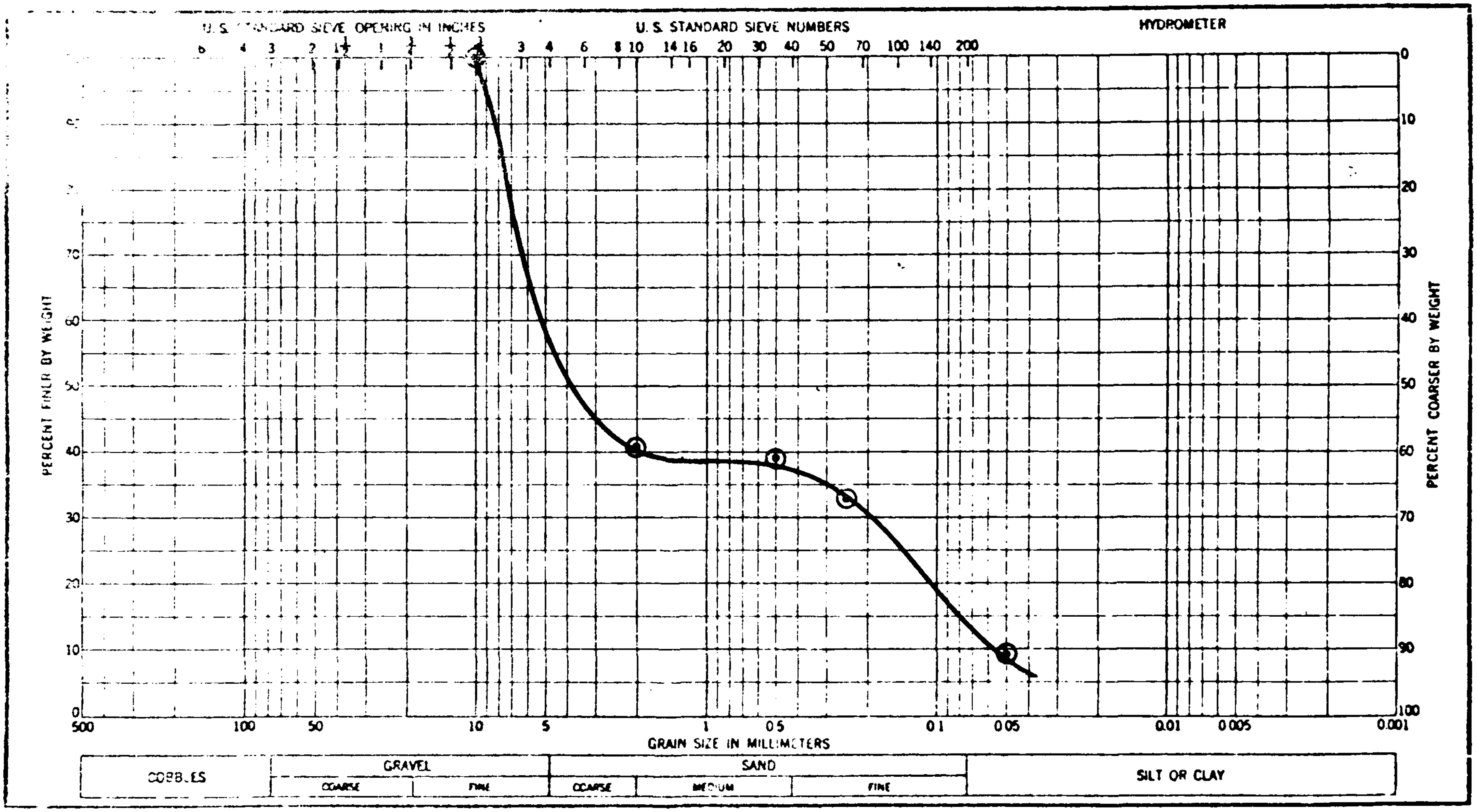


FIGURE I-39. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 18.

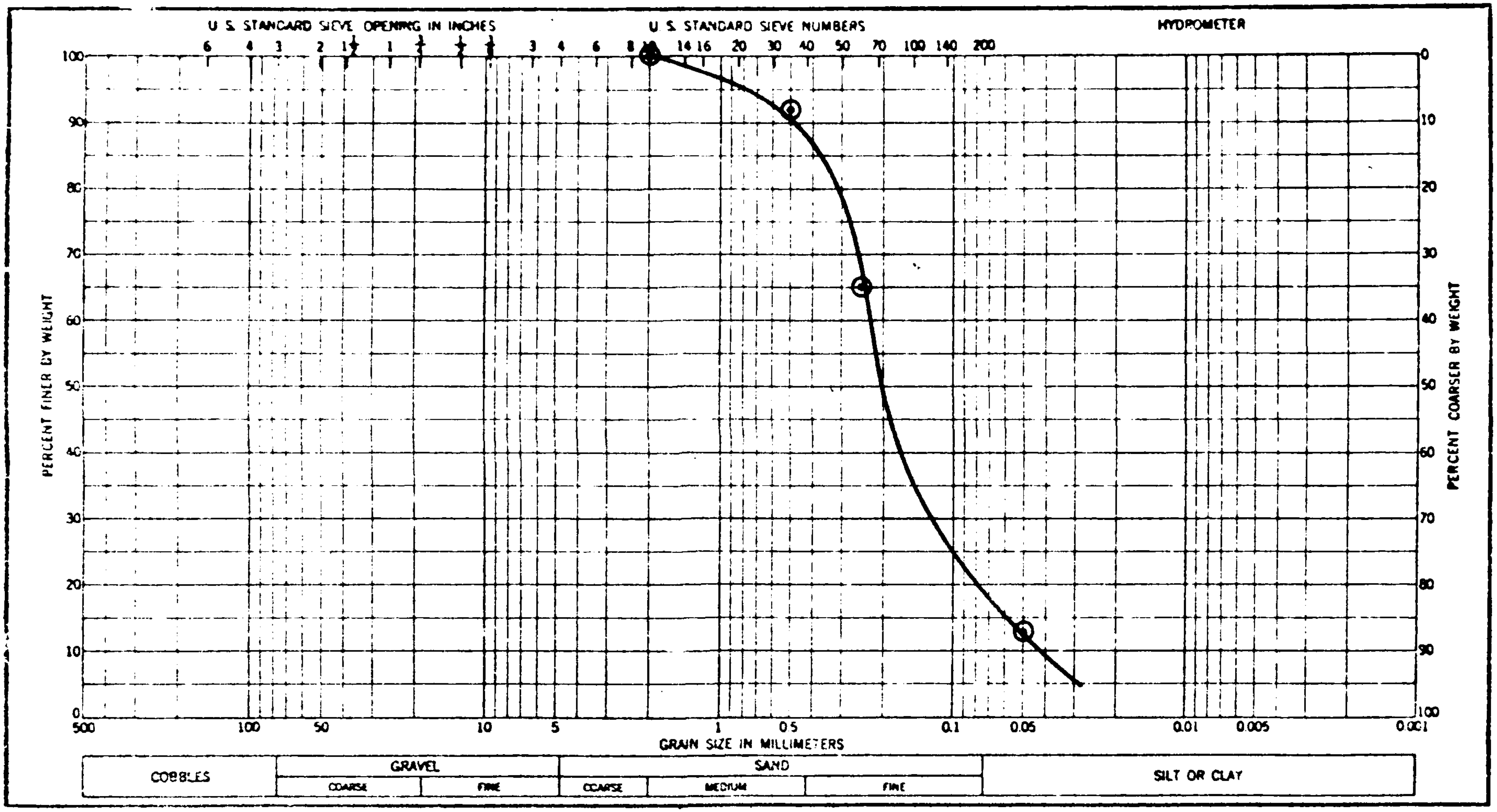


FIGURE I-40. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 19.

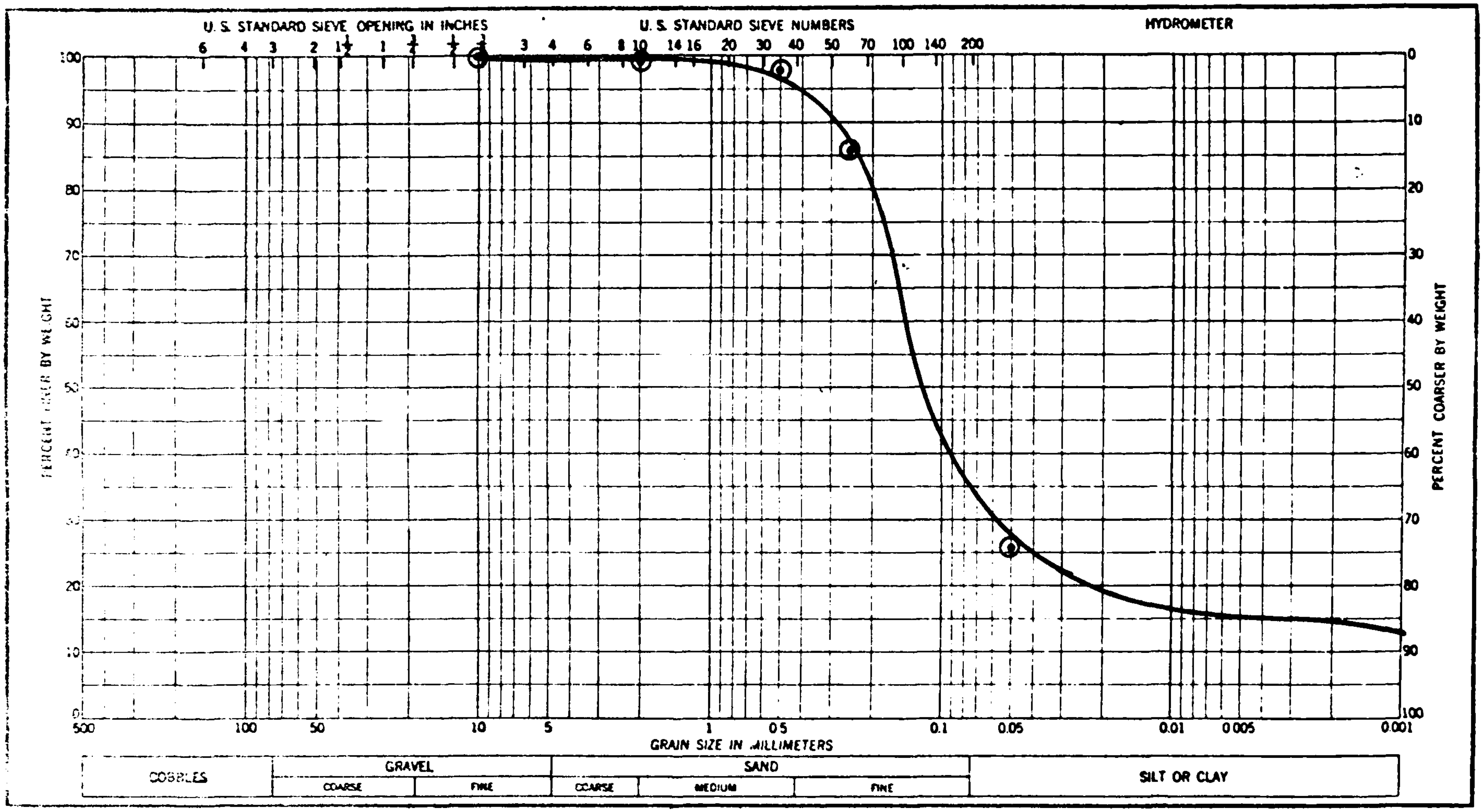


FIGURE I-41. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 20.

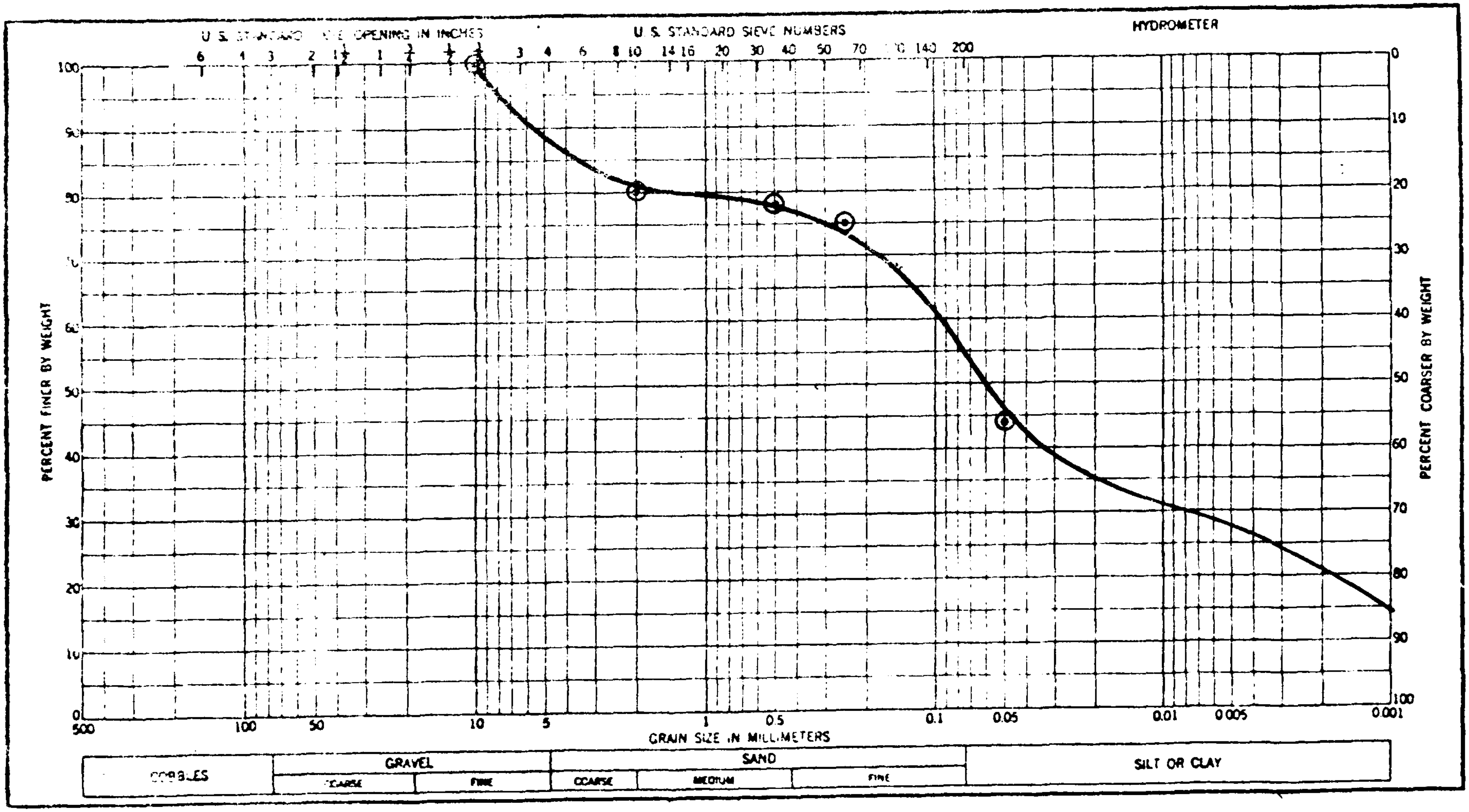


FIGURE I-42. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 21.

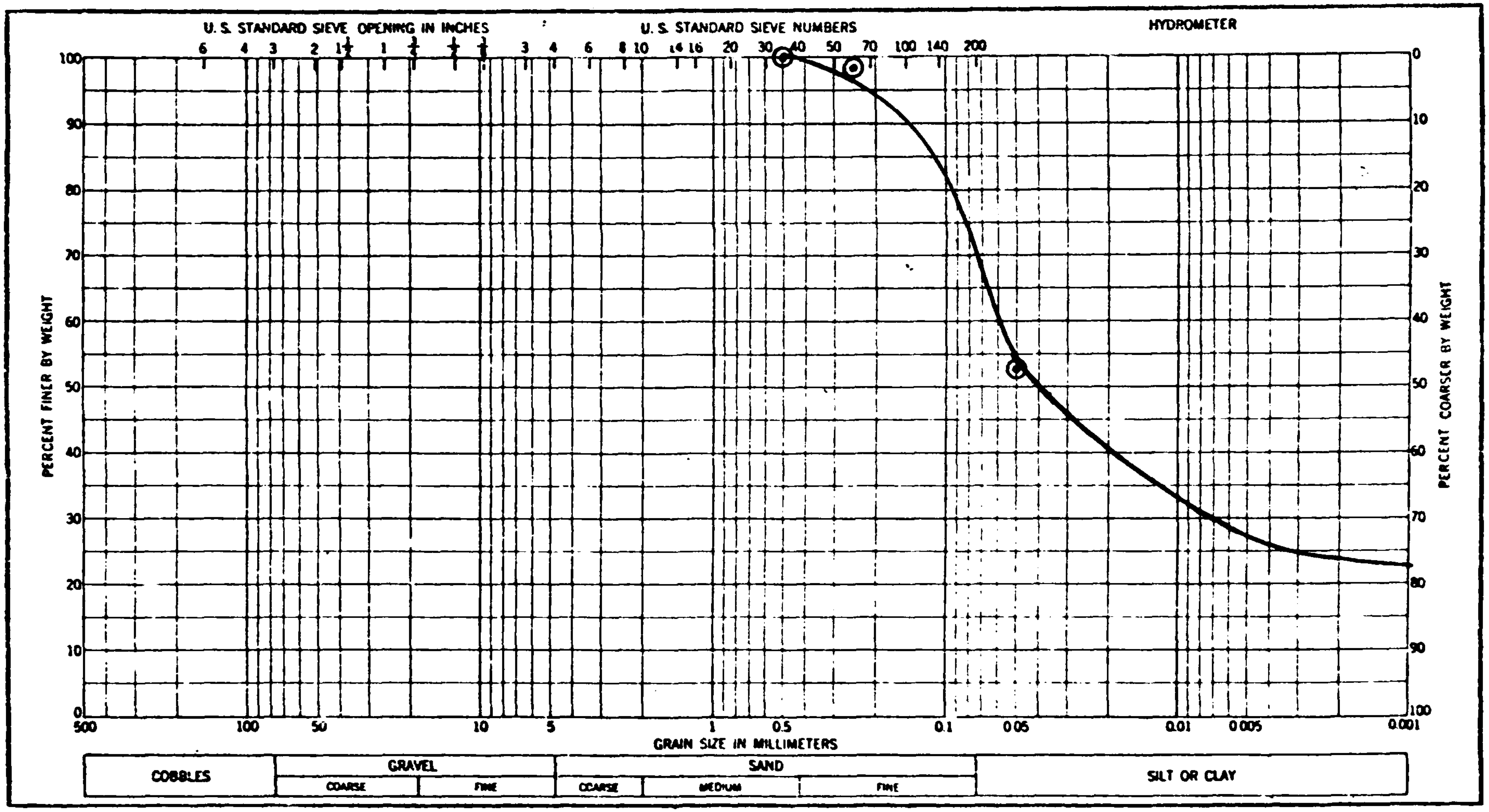


FIGURE I-43. Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 22.

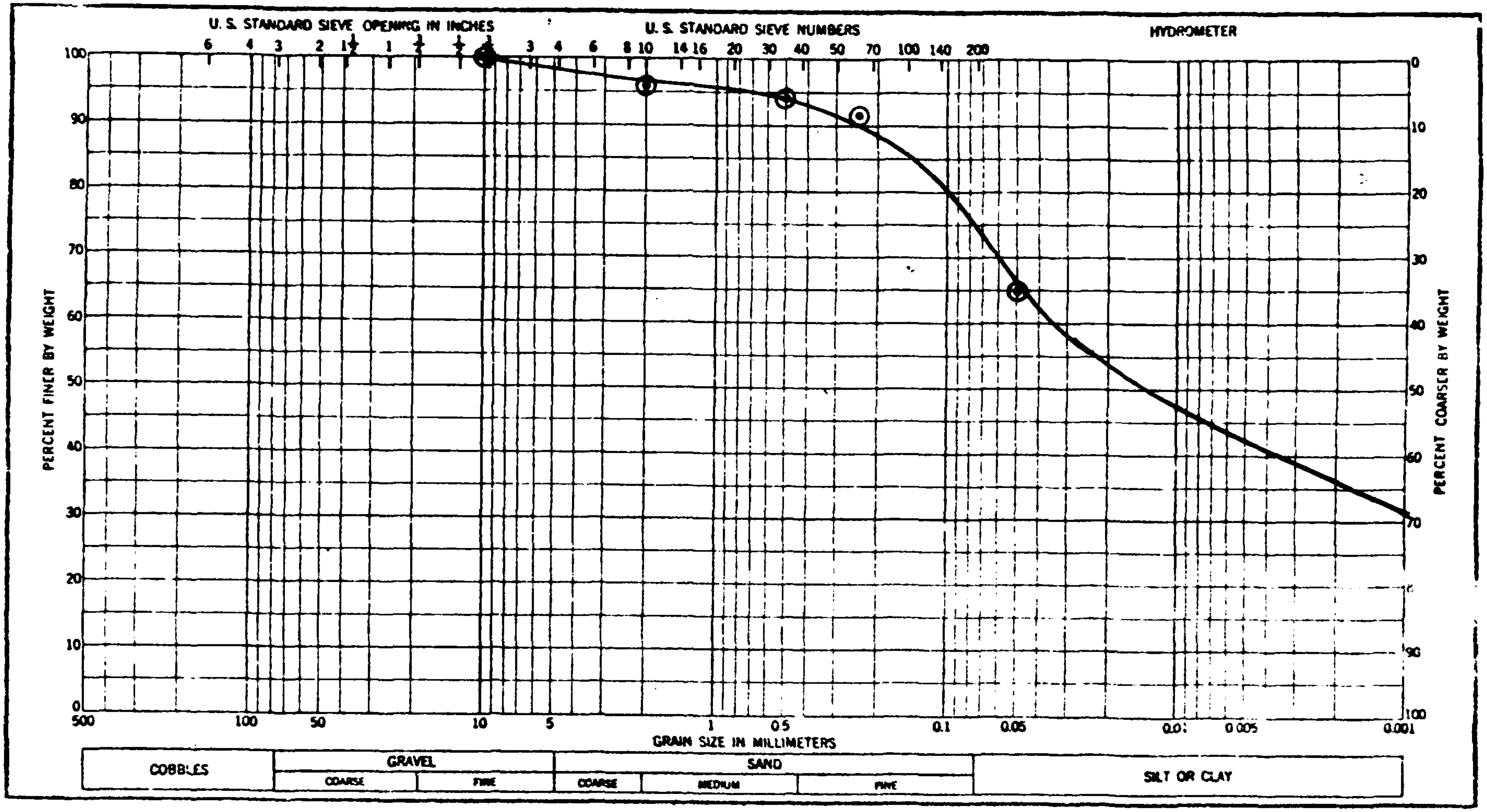
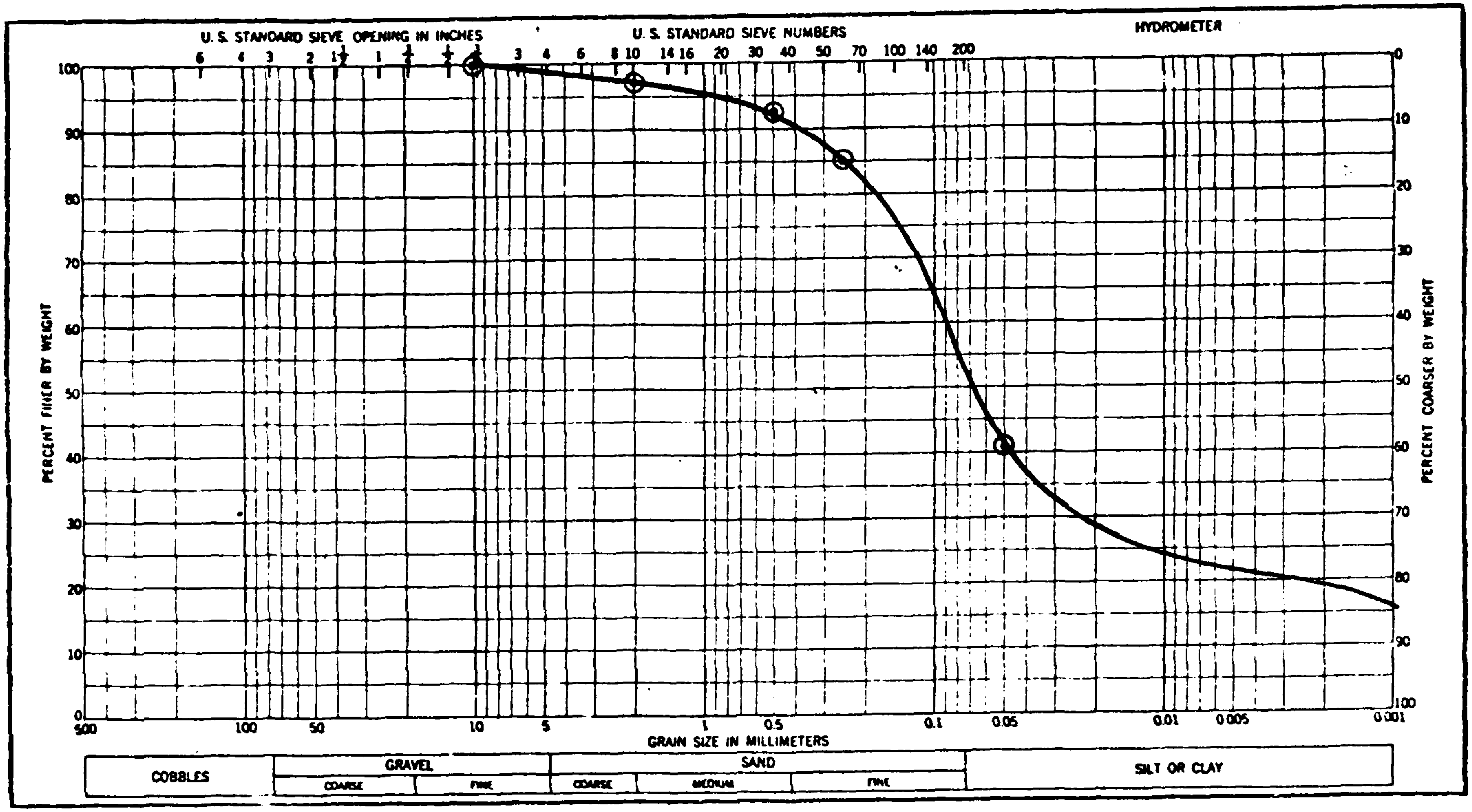


FIGURE I-44 . Grain size analysis of sediment, Middle Black Warrior-Tombigbee Rivers, August, 1979, Station 23.



APPENDIX J

SEDIMENT CHEMICAL ANALYSES

TABLE J-1. Results of analyses for sediment physical-chemical parameters, Middle Black Warrior-Tombigbee Rivers, August 27 - 31, 1978.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	22	23
		DATE	8/28	8/28	8/28	8/28	8/29	8/29	8/29	8/30	8/30	8/30	8/30	8/31	8/31	8/31	8/31	8/27	8/27	8/27	8/27		8/31
		TIME	1015	1225	1500	1605	0955	1530	1615	1130	1345	1600	1800	1020	1140	1300	1500	1000	1130	1345	1650		1745
		UNITS																					
70325	Volatile Solids	mg/kg	17,290	10,988	16,510	19,058	29,260	24,912	27,742	29,609	20,545	14,703	6697	10,082	27,792	22,843	30,959	10,026	36,304	60,135	63,200	31,360	44,963
00687	TOC	g/kg	38.4	11.6	4.9	19.1	8.1	6.6	7.9	11.5	8.0	6.1	4.3	7.5	11.3	8.2	8.9	0.7	3.9	12.5	8.3	9.0	11.2
00627	TKN	mg/kg	72	120	131	159	133	89	139	112	80	29	34	52	22	18	46	9	75	208	295	41	34
00557	Oil and Grease	mg/kg	216	10	75	<1	161	9	70	74	104	82	34	32	8	27	18	110	48	<1	13	14	<1
00668	[illegible], Total	mg/kg	343	494	248	146	341	201	226	283	265	139	168	142	212	224	253	256	273	504	372	220	673
01043	Copper, Total	mg/kg	1.49	1.27	2.05	2.05	3.40	2.05	3.63	4.64	2.62	0.48	0.82	1.38	3.29	4.64	6.22	0.50	1.50	2.40	3.00	3.05	3.40
01170	Iron, Total	mg/kg	4524	3809	10,024	8952	10,952	11,310	11,167	13,024	10,452	8024	3595	5238	12,095	10,095	14,667	975	5188	10,000	11,285	1058	15,095
01052	Lead, Total	mg/kg	8.8	9.2	9.4	8.2	9.4	8.8	12.9	11.1	12.3	7.0	3.5	7.0	13.5	8.2	15.8	3.0	6.[illegible]	7.5	7.5	10.6	14.1
01053	Mn, Total	mg/kg	183	169	637	570	640	588	603	650	556	419	139	298	862	613	577	76	218	312	579	62	593
71921	Mercury, Total	mg/kg	0.09	0.17	0.15	0.19	0.18	0.11	0.06	0.04	0.02	0.01	0.26	0.02	0.15	0.08	0.13	0.20	0.17	0.18	0.17	0.02	0.02
01028	Cadmium, Total	mg/kg	0.05	0.03	0.01	0.01	0.03	0.03	0.06	0.07	0.05	0.03	0.02	0.05	0.05	0.02	0.09	0.03	0.05	0.09	0.14	0.06	0.09
01068	Nickel, Total	mg/kg	4.6	4.3	5.7	7.8	10.0	8.2	11.0	12.8	8.9	6.1	2.5	8.5	13.2	11.4	16.0	1.3	5.0	8.8	10.0	10.5	12.1
01093	Zinc, Total	mg/kg	24.3	15.0	21.0	26.0	31.9	29.4	39.4	44.4	36.9	23.3	7.8	19.4	42.7	36.8	55.7	3.8	15.4	28.1	28.8	36.7	43.5
01003	Arsenic, Total	mg/kg	0.38	0.48	0.80	0.74	0.76	0.80	0.80	0.82	0.78	0.72	0.36	0.50	0.76	0.80	0.80	0.14	0.44	0.76	0.74	0.74	0.78
01029	Chromium, Total	mg/kg	4.3	4.3	5.3	6.2	6.2	5.3	8.1	9.1	6.2	6.2	2.4	4.3	10.0	4.3	10.0	2.0	6.8	14.5	10.1	17.9	17.6

TABLE J-2. Results of Pesticide Residue analysis on Sediment Samples, Middle Black Warrior-Tombigbee Rivers, August 27 - 31, 1978.

PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	22	23
	TIME																					
	DATE	8/78	8/78	8/78	8/78	8/78	8/78	8/78	8/73	8/78	8/78	8/78	8/78	8/78	8/78	8/78	8/78	8/78	8/78	8/78	8/78	8/78
	UNITS*																					
BHC - Alpha	µg/kg	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	0.4	<0.3	<0.3
BHC - Gamma	µg/kg	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	2.2	2.1	<0.3	<0.3
BHC - Beta	µg/kg	4.5	<0.8	<0.8	1.4	<0.8	0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	1.4	<0.8	<0.8	<0.8	<0.8
Heptachlor epoxide	µg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	1.5	1.0	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Aldrin	µg/kg	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Dieldrin	µg/kg	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	0.9	<0.8	<0.8	<0.8	2.0	1.0	<0.8	1.0	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
p,p´ - DDE	µg/kg	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.5	<0.3	<0.3	1.0	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
p,p´ - DDD	µg/kg	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
p,p´ - DDT	µg/kg	<3	<3	<3	<3	<3	<3	<3	[illegible]	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
o,p´ - DDT	µg/kg	8.5	<8	<8	<8	<8	<8	<8	<8	<8	<8	12.0	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Endrin	µg/kg	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Mirex	µg/kg	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
Methoxychlor	µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Chlordane	µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Toxaphene	µg/kg	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
PCB - 1242	µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
PCB - 1254	µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
PCB - 1260	µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8

* Values are calculated on a dry weight basis.

TABLE J-3. Results of analyses for sediment physical-chemical parameters, Middle Black Warrior-Tombigbee Rivers, August 26 - 29, 1979.

STORET CODE	PARAMETER	STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
		DATE	8/26	8/26	8/26	8/26	8/26	8/29	8/29	8/29	8/29	8/29	8/28	8/28	8/28	8/28	8/28	8/27	8/27	8/27	8/27	8/28	8/28	8/28
		TIME																						
		UNITS																						
70322	VOLATILE SOLIDS	mg/Kg	33,852	37,06[illegible]	5,7[illegible]	17,876	15,249	24,038	13,778	26,223	25,674	14,816	6,916	12,542	21,621	9,650	19,988	17,315	9,844	16,118	41,387	34,068	36,379	30,012
00680	TOC	g/Kg	27.3	21.0	1.19	3.52	1.76	8.28	2.43	6.07	6.47	4.41	1.18	2.78	4.17	4.57	3.45	4.81	2.92	4.23	11.0	9.14	6.09	5.53
00627	TKN	mg/Kg	342	278	133	392	173	459	242	459	356	238	108	260	294	211	305	266	175	311	686	501	662	413
00557	OIL & GREASE	mg/Kg	135	123	39	33	36	47	58	66	71	27	74	70	81	75	61	42	27	52	47	106	52	51
00668	P, TOTAL	mg/Kg	137	97	132	222	180	290	159	226	244	276	123	204	259	179	227	316	232	291	467	470	502	349
01043	COPPER, TOTAL	mg/Kg	6.1	6.4	2.5	6.4	5.8	10	3.0	8.3	6.3	2.2	2.4	3.6	6.1	5.6	5.6	2.5	2.5	3.7	4.7	5.8	9.4	5.1
01170	IRON, TOTAL	mg/Kgx10[3]	8.3	7.8	8.0	12	17	18	6.7	20	14	7.6	6.2	8.5	7.6	12	12	16	8.2	12	23	16	21	17
01052	LEAD, TOTAL	mg/Kg	8.3	9.0	6.2	7.9	8.7	14	3.9	12	9.5	6.0	3.6	4.7	4.9	9.4	6.6	20	5.2	6.3	10	12	14	12
01053	Mn, TOTAL	mg/Kg	350	180	280	350	730	760	310	410	430	370	270	300	310	440	380	320	170	260	500	345	780	400
71921	MERCURY, TOTAL	mg/Kg	0.05	0.05	0.02	0.03	0.04	0.07	0.03	0.10	0.04	0.02	0.02	0.03	0.04	0.05	0.02	0.03	0.11	0.04	0.07	0.05	0.06	0.08
01028	CADMIUM, TOTAL	mg/Kg	0.58	0.55	2.0	0.64	0.60	0.94	0.43	0.56	0.58	0.37	0.51	0.44	0.49	0.73	0.63	0.60	0.55	0.67	0.86	1.0	1.3	0.71
01068	NICKEL, TOTAL	mg/Kg	8.0	9.3	2.7	9.0	8.9	12	4.7	13	8.5	5.1	4.6	6.8	3.9	8.2	7.7	8.0	3.4	6.4	13	10	17	9.6
01093	ZINC, TOTAL	mg/Kg	27	25	13	32	31	52	15	55	36	14	10	15	18	26	34	23	13	30	41	41	63	40
01033	ARSENIC, TOTAL	mg/Kg	4.8	3.8	3.3	3.5	7.0	7.6	3.9	6.2	8.7	4.0	2.9	6.9	3.9	5.5	7.2	2.6	3.6	4.1	8.8	10.2	10.0	7.0
01029	CHROMIUM, TOTAL	mg/Kg	7.8	9.0	4.9	11	16	14	7.9	16	11	10	7.1	9.4	7.4	12	12	21	12	19	26	29	34	24
70320	% MOISTURE		18.8	17.2	16.7	22.1	21.1	43.4	20.3	38.3	27.5	20.7	19.2	20.6	24.7	21.0	27.0	16.7	20.8	25.1	37.0	40.0	45.9	33.5

APPENDIX K

BACTERIOLOGICAL STATIONS

TABLE K-1 . Summary of results of bacteriological analyses, Middle Black Warrior-Tombigbee Rivers, July, 1978 through October, 1979.

TRIPS	DATE	FECAL COLIFORM NO./ 100 ml				FECAL STREPTOCOCCI NO./ 100 ml				F.C./F.S. RATIO*			
		C - 1	C - 2	C - 3	C - 4	C - 1	C - 2	C - 3	C - 4	C - 1	C - 2	C - 3	C - 4
1	8/3/78	27	10	20	40	< 2	< 2	< 2	< 2	>14	> 5	>10	>20
2	9/1/78	14	4	25	25	< 1	< 1	< 1	< 1	>14	> 4	>25	>25
3	10/4/78	200	4	10	260	10	14	6	54	20	< 1	3	5
4	12/14/78	46	5	14	205	23	0	5	40	2	> 5	3	5
5	2/26/79	224	373	289	200	430	1040	510	430	< 1	< 1	< 1	< 1
6	5/16/79	15	5	7	85	3	4	16	242	5	1.2	0.4	0.4
7	6/18/79	2	0	13	1	7	28	40	6	0.3	**	0.3	0.2
8	7/31/79	39	3	7	17	62	480	28	220	< 1	< 1	< 1	< 1
9	8/28/79	50	90	54	400	24	10	10	122	2.1	9	5.4	3.3
10	10/2/79	48	5	18	3700	24	19	4	930	2	< 1	4	4

C - 1 through C - 4 are bacteriological sampling stations in Demopolis Reservoir.
* Fecal Coliform ÷ Fecal Streptococci
** No coliforms present, unable to calculate ratio.

APPENDIX L

PHYTOPLANKTON

TABLE L-1. Phytoplankton species identified, Middle Black Warrior and Tombigbee Rivers, July 30 - August 4, 1978.

TAXA \ STATION NO.	1	2	3	4	5	6	7	9	10	12	13	14	15	16	17	18	19	20	21	23	
CHLOROPHYTA																					
Volvocales																					
Eudorina sp.					286										102			71	260		
Gonium sp.																		142	195	276	
Pandorina morum	9		249	263	2000										111	47		212	195		
Unidentified flagellates	12																				
Tetrasporales																					
Gloeocystis	15	47														3	4				
Sphaerocystis shcroeteri															21						
Ulotrichales																					
Ulothrix subtilissima (?) (cf. *Hormidium* sp.)	12	14	27	107		278	2000	257		328	268		1,800	494				119	330	638	
Chlorococcales																					
Micratinaceae																					
Golenkinia sp.																9		13		17	
Characiaceae																					
Schroederia setigera																22			61	17	
Hydrodictaceae																					
Pediastrum sp.																		97	130		
Sorastrum sp.																				276	
Coelastraceae																					
Coelastrum sp.	2	23	124	66	286											28	164	102			
Oöcystaceae																					
Ankistrodesmus spp.		5	4			208		28	200		240		130	47	25	27	70	212	199	52	
Chodatella spp.		1		4		69									5	1	8	4	53		
Gloeoactinium sp.																4	129	84	8		
Franceia sp.						69											8				
Kirchneriella spp.	1	27	4	4				111							30	47	39	27	37		
Nephrocytium sp.																	12		16		
Oocystis sp.	1	2	19	16										94	9		12		12	34	
Radiococcus nimbatus																6					
Selenastrum spp.		4				69												44			
Tetraedron spp.															9		4	13			
Westella botryoides						830											78				
Scenedesmaceae																					
Crucigenia spp.		19											500	94	145	29	47	35	33		
Scenedesmus quadricauda	3				143				600	60		417	2000	565	37	62	296	615	309	552	
Scenedesmus spp.		8	47	49		556	750	111			240			447	102	97	257	372	325	276	
Tetrastrum spp.														165	18	6	31	66		140	
Unidentified chlorophytes		10	12	37	179			28	100		30				3,835	38	51	80	138	34	
Fragmented colonies			186	111	1,290	556		185				292						11	215	207	

UNITS = number per liter x 10^{-3}.

TABLE L-1. Continued.

TAXA \ STATION NO.	1	2	3	4	5	6	7	9	10	12	13	14	15	16	17	18	19	20	21	23
Zygnematales																				
Arthrodesmus sp.		1																		
Closterium sp.		3																		
Cosmarium spp.		4	4												9		4			
Euastrum sp.															5		4		4	
Spondylosium sp.																				
Staurastrum spp.	1	2		4		59									5	3	12	4		
EUGLENOPHYTA																				
Euglena sp.	1							28							2	3		4		
Phacus spp.	2	10	40	119	393			84		30	119	125			5		23			
Trachelomonas spp	2	1											125		9	4	4	4	101	52
PYRROPHYTA																				
Peridinium sp	4	1	8	12		139							125	24	9		12	71	77	52
CHRYSOPHYTA																				
Chrysophyceae																				
[illegible] capitatium				4												1	4			
Bacillariophyceae																				
Centrales																				
Cyclotella glomerata	111	201	1,430	1,910	16,600	29,100	47,100	11,200	43,200	15,100	9,580	11,100	45,300	10,600						6,310
Cyclotella spp.	2	14	35	12							60	83			21	6	35	155	57	17
Melosira granulata		18	.202	91	1,070		750	335	2500	1,490	746	1,630	3,750	1010	983	569	741	173	402	397
Melosira sp.	12													71		22	27	66	8	
Stephanodiscus sp																1				
Pennales																				
Achnanthes spp.	4	3																		
Cymbella sp.	1																			
Fragilaria crotonensis	25	46	23						200											
Fragilaria spp.				62		69		28			90	125	125	47		3	16	31	53	103
Navicula sp.	2	4	8	8					200		-	83			7		4		8	
Nitzschia spp.	5	3	27		36	69	125			90			500							
Synedra spp.	5	8		4	36	208	250		100	30	90		375	14	53	15	27	212	37	
Unidentified Pennates	8	9	23	21	142	208				60		167		71	12		12	18		17
CYANOPHYTA																				
Chroococcales																				
Agmenellum quadruplicatum	17	57	62	1,450	2,290				800		716	1500	20,500	565	1,870	1,420	8000	2,250	1500	1,240
Anacystis (colonies)		39		107					1900										16	
Hormogonales																				
Anabaena													375	683					211	
Oscillatoria sp.	9														39					
Raphidiopsis curvata						486		78					1,625	94						103

UNITS - number per liter x 10^{-3}.

TABLE L-2. Phytoplankton species identified, Middle Black Warrior and Tombigbee Rivers, August 27 - 31, 1978.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	15	16	17	18	19	20	21	22	23
CHLOROPHYTA																					
Volvocales																					
Eudorina elegans																	85				
Pandorina morum																	42	187			
Tetrasporales																					
Gloeocystis sp.														5			111				
Sphaerocystis schroeteri							194									71					
Ulotrichales																					
Ulothrix sp.	7																				
Oedogonium sp.	4	4																			
Chlorococcales																					
Micratinaceae																					
Golenkinia sp.															2	2	16	2			
Dictyosphaeraceae																					
Dictyosphaerium spp.	1	26					60		45	154	212					51		5		104	
Characiaceae																					
Schroderia setigera				9												22		18	56		4
Hydrodictyaceae																					
Pediastrum spp.									34												
Sorastrum americanum		15																			
Coelastraceae																					
Coelastrum spp.									90				634	123	18						61
Oöcystaceae																					
Ankistrodesmus spp.	1	4	6	9			15		34	19	19	21	20	41	7	13	24	147	273	142	53
Choulatella spp.																	3				
Closteriopsis longissima																				15	4
Franceia spp.														15	4		3				
Kirchneriella spp.										19	154					76	24	20		15	4
Nephrocytium sp.									101						7						27
Oocystis spp.	2	4	23	9	30		30									4	3				11
Pachycladon umbrinus																				15	
Selenastrum sp.																7					11
Tetraedron spp.	5	4					30	48	11	19	77	14	50	26	4		24	3	6	15	4
Treubaria sp.					10											2	5				
Westella botryoides														21					31		
Unidentified unicells	2	4	17	9	10			15	11					31	90	129		97		187	141
Fragmented colonies	12	17	41									56					16	13		22	27
Scenedesmaceae																					
Crucigenia spp.		38			238		119						119	92	9	80	129	54	25		46
Scenedesmus quadricauda		11	47						134	154			40	185	9	71	34	17		164	38
Scenedesmus spp.	7	26		158	40	700	433	154	45	269	154		119	159	80	152	267	104	99	90	191
Tetrastrum spp.														21		27	100			52	15
Zygnematales																					
Zygnemataceae																					
Mougeotia sp.							90														

Station 14 was not collected during this sample period.

UNITS = number per liter x 10^{-3}.

TABLE L-2. Continued.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	15	16	17	18	19	20	21	22	23
Desmidaceae																					
Cosmarium sp.			6															2			
Euastrum sp.			6											5		4					
Sphaerozosma granulatum				18																	
Spondylosium planum			12														3				
Staurastrum spp.	1		12							19		7		10			3				
EUGLENOPHYTA																					
Euglena spp.			6			50									2	18		3		7	
Phacus spp.		8	6	9									10		9	38	5	3	12		
Trachelomonas spp.	5	9		9			45	48	34	19			20		13	11	18	17	62	30	
CHRYSOPHYTA																					
Bacillariophyceae																					
Achnanthes spp.	9	8	12	18	10				22		38							2	6	22	4
Cocconeis sp.							64				19										
Cyclotella glomerata	180	874	1870	4240	3200	78,200	4,390	4110	2780	4870	7080	2250	2530	1070						1010	541
C. stelligera	7	6		26	10	100	90	32	10	115		35	50	5				10		30	11
C. spp.											135				189	83	106		19		
Cymbella sp.	1		6				15														
Fragilaria spp.	8	8	23	18	20		15					14	20		16			2			
Gomphonema sp.	1																				
Melosira distans	1					100									113	31			31	52	4
M. granulata	3	23	209	123	960	4700	2490	2620	2980	4420	1900	1140	891	856	500	176	132	30	19	1110	324
M. spp.																					
Navicula spp.	7	4							11									2		15	15
Nitzschia sp.	4	4	6	18				15				7		10	2					7	
Pleurosigma sp.	1						15			19											
Surirella sp.			17																		
Synedra spp.	3	8	23	44	59	50		[illegible]	90	19	96	21			16	16		40	19	22	8
Unidentified pennates	16	30	47	44	30		30	32		38		35	30	21	47	9	29	28	25	97	53
PYRRHOPHYTA																					
Peridinium spp.	6		17			50	30		11	19		14	30	10	16		37	25	56	22	
CYANOPHYTA																					
Chroococcales																					
Agmenellum quadriduplicatum	15	90	93				60			1540	308		634	697	222	3320	703	134	776	1160	244
Anacystis sp.	3					50	15			384		357		67	9		111	30	12	60	11
Gomphosphaeria aponica (cells)													69						143	224	179
Hormogonales																					
Anabaina sp.																		27	93		
Anabaenopsis circinalis																	61				
Lyngbya sp.															42						
Oscillatoria spp.			180												540 [a]	860 [a]	148 [a]		3130 [b]		
Raphidiopsis curvata																			261	291	72
Spirulina sp.														10							

Station 14 was not collected during this sample period.

[a] *Oscillatoria limnosa* (cells)

[b] *Oscillatoria* (cf. *prolifica*)

UNITS = number per liter x 10^{-3}.

TABLE L-3. Phytoplankton species identified, Middle Black Warrior and Tombigbee Rivers, October 1 - 5, 1978.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	1[illegible]	14	15	16	17	18	19	20	21	22	23
Chlorophyta																						
Volvocales																						
Chlamydimonas																				621	14	
Eudorina elegans																			112	138		
Pandorina morum														178								
Tetrasporales																						
Elakatothrix gelatinosa		21																	42			
Sphaerocystis schroteri	196		503				679	365	71						35			436				
Chlorococcales																						
Micratinaceae																						
Golenkinia sp.																11						
Dictyosphaeraceae																						
Dictyosphaerium spp.														44		22		59			28	
Characiaceae																						
Schroderia setigera																		20				
Hydrodictyaceae																						
Pediastrum spp.							71												49			
Coelastraceae																						
Coelastrum spp.	48	60		41						119				244			101	79		69	28	46
Oocystaceae																						
Ankistrodesmus spp.	12	4	21	36	167	107		115	18	30	30	21	42			6		129	56	103	35	53
Chodatella spp.			3	5											9	3		40	7			13
Closteriopsis longissima															9						7	
Franceia spp.																6			35	9		
Gloeoactinium limneticum																30		323	245	86		
Kirchneriella spp.	11			30						30								168	7		14	
Nephrocytium sp.		4																	14		28	
Oocystis spp.		2		25		36								11	35	19	6		21	9		20
Selenastrum sp.																			28			20
Tetraedron spp.							71					11		22	18	17	6	40	7		106	66
Westella botryoides																11						
Unidentified unicells	22	53	75	61	167	71		77	143	209	194	85	97	100		188	308	505	231	328	113	184
Fragmented colonies										418	358	277	222	222	88	25		59	35		284	349
Scenedesmaceae																						
Crucigenia spp.	18	8										213			35	6	50	40	245		255	53
Scenedesmus quadricauda			5	30				115	393	179	119	43	56	67	105		113	40	112		43	79
Scenedesmus spp.	2			10		357	357	115		522	209	181	24	322	246	83		614	510	345	397	50
Tetrastrum spp.		8			167						60				36		25					
Zygnematales																						
Desmidaceae																						
Arthrodesmus sp.																					7	
Cosmarium spp.				5								21					6	10			14	
Euastrum spp.	1										15	11				8			7	17	7	7
Staurastrum spp.						36								11								
Closterium sp.	1																					

UNITS = number per liter x 10^{-3}.

TABLE L-3. Continued.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Euglenophyta																						
Euglena spp.	1	4	3		83				18				14	11	9	22	82	59	154	121	63	224
Phacus spp.			3														38	79	35	17	7	
Trachelomonas spp.	2	9	3	25	42	71	71	19	18	60	75	43		11		53	208	307	308	302	57	39
Chrysophyta																						
Bacillariophyceae																						
Achnanthes spp.	3	2	3							15			28			3	13				7	
Cocconeis sp.																	6					
Cyclotella glomerata	17	26	42	792	21,500	15,100	11,400	6,150	5,660	3,940	4,210	2,840	3,380	2,760	2,040		57				1,310	1,110
C. stelligera	11	36	59	107	208	250	214		89	119	104			89	53	17				155	78	59
C. spp.	2							135		15		74	125					59	56			
Cymatopleura sp.																					7	
Cymbella sp.	1	2		10																		
Fragilaria spp.	12	9	10	10			71	77	18		75	32	28		26	11		50	42	43	50	53
Gomphonema sp.																3						
Gyrosigma sp.																3						
Melosira distans	5	8	41					58		149	134	117	28	156	35	119	69	168	112	52	227	13
M. granulata	7	11	44	233				231	196	403	478	266	500		386	305	541	1,210	573	336	269	230
M. spp.						214	276															
Navicula spp.	2	8		5											9							
Nitzschia spp.		2						19														13
Pinnularia sp.				5																		
Pleurosigma sp.		2					71							11							7	
Rhizosolenia sp.																					7	
Surirella sp.				5							15						13					
Synedra spp.			3						36	15	15		28	44	35	8		10				
Unidentified pennates	9	19	21	30						30	45	53	69	56	35	47	63	69	14	26	28	26
Pyrrophyta																						
Peridinium spp.		2	3	10		143	36			30	60	32	42	56		25		40			78	33
Cyanophyta																						
Chroococcales																						
Agmenellum quadriduplicatum	1,810	7,300	6,630	23,100	5,670	1,140			304	836	716	2,940	3,380	3,640	140	867	1,640	297	196	2,440	844	954
Anacystis sp. (plants)												21		22		6		40	14	69	14	33
Gomphosphaeria aponica (cells)										313			306							1,090		
Hormogonales																						
Oscillatoria angustissima (cells)	10			183												100	836					
Raphidiopsis curvata (plants)											75					19			14		21	
Spirulina sp. (plants)																				9		

UNITS = number per liter x 10^{-3}.

TABLE L-4. Phytoplankton species identified, Middle Black Warrior and Tombigbee Rivers, December 10 - 14, 1978.

TAXA / STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
CHLOROPHYTA																						
Chlorococcales																						
Dictyosphaeraceae																						
Dictyosphaerium sp.																		22				
Coelastraceae																						
Coelastrum microporum																11				16	5	
Oocystaceae																						
Ankistrodesmus spp.			5				3	12	7	12	4	18	18	31	21	16	6	28	2	23	7	25
Chodatella sp.																1						
Closteriopsis longissima																			1			
Franceia sp.															9							
Kirchneriella spp.				4												1	1					
Oocystis sp.		2						3	3					14		4	4				6	
Tetraedron sp.					1					3		4								2		1
Scenedesmaceae																						
Crucigenia spp.				21			6						8	100					6		11	
Scenedesmus acuminatus																97	85	62	2	225	71	58
S. armatus																		22				
S. bijuga							18															
S. brasiliensis									9	24												
S. dimorphus												29	8	11						37		
S. opoliensis																43				18		
S. quadricauda											14		4		30	15	13				62	
S. spp.		21										21	8	17	24		10			43	37	4
Tetrastrum sp.															12		3					5
Unidentified unicells	13	5	7	4	12	42	30	42	37		21	43	53	59	71	32	25	8	9	30	34	14
Zygnemetales																						
Cosmarium sp.																		3		1		
Staurastrum sp.				1							2			3								
EUGLENOPHYTA																						
Euglena sp.											2		2		3			3	1		[illegible]	7
Phacus sp.												4							1			
Trachelomonas sp.		2	4	3	4	9	6	3	4		9	7	6	8	9	2	4		8	4	7	5
PYRROPHYTA																						
Peridinium sp.																			1			

UNITS = number per liter x 10^{-3}.

TABLE L-4. Continued.

TAXA / STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
CHRYSOPHYTA																						
Bacillariophyceae																						
Achnanthes	3	5	9	8	2		4	6	4	3		4	4		3	1	3	3	2	4	3	1
Asterionella formosa																	2					
Cyclotella glomerata		92	284	298	110	814	291	764	548	704	420	843	343	569	604			6		5	9	10
C. meneghiana									2			4				3	2	3			1	1
C. stelligera	247	38	11	18	22	12	19	21	22	33	16	29	22	22	45	25		8	10	26	17	12
Cymbella sp.	1	2	3	4	1		3					4				1	2	3				
Eunotia sp.		1	4																			
Fragilaria sp.								6					2		9	2	5	8			1	
Gomphonema sp.		1										4	2	8		1	2	3	1			
Gyrosigma sp.																				1		
Melosira distans	12	14	27	3	30	42	27	57	31	71	16	57	65	117	104	3	6	42	1	22	14	22
M. granulata		10	13	16	52	103	87	7	116	53	145	132	138	114	128	116	109	179	190	104	119	149
M. varians													6				2	3				1
Navicula spp.	5	3	4	4	5		6		9	3			2				3	8	1	2		1
Nitzschia spp.		2	5		3	12	3	9	7	6	4	11		3		1	7	11	1	3		
Pleurosigma sp.	1		4		3							4				1	8				1	
Stauroneis sp.									2				2							1		
Surirella sp.			1		1			3								1	7		1	1		1
Synedra sp.			3		5	3		3	4	9	9	7		3	24	3	7	2			5	1
Tabellaria sp.																	1					
Unidentified pennate diatoms	3	1	3	3	4		1	12	7	6	4	4	12	8	9	3	12	28	4	6	3	4
CYANOPHYTA																						
Chroococcales																						
Agmenellum quadriduplicatum		26	75					48		95						22						
Anacystis thermale																10					12	
Gomphosphaeria wichurae															107							59
Hormogonales																						
Oscillatoria limnosa	28						18									1				60		

UNITS = number per liter x 10^{-3}.

TABLE L-5. Phytoplankton species identified, Middle Black Warrior and Tombigbee Rivers, February 27 - March 2, 1979.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Chlorophyta																						
Volvocales																						
Gonium pectorale	7																					
Volvocalean cells	3	3	4	2	1	2	8	5	9								4	5				
Dictyospaeraceae																						
Dictyosphaerium sp.									3													
Oocystaceae																						
Ankistrodesmus spp.	2	2	3	1	1	7	4	3	2		2								5	10	10	17
Closteriopsis longissima		.4																				
Kirchneriella sp.					1																	
Oocystis sp.	2														11		4					
Tetraedron sp.	.4																					
Unknown chlorophytes	2	3	2		4	2	4	2	2	5	2	6			5			2				
Scenedesmaceae																						
Scenedesmus quadricauda	3						3															26
Scenedesmus acuminatus																	26	37	52			43
S. spp.		5	3			2			2													
Desmidaceae																						
Closterium sp.									1	1												
Euglenophyta																						
Euglena sp.		.4							1					2	3							
Trachelomonas sp.	.4																				5	
Pyrrophyta																						
Peridinium sp.							1															

UNITS = number per liter x 10^{-3}.

TABLE L-5. Continued.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Chrysophyta																						
Bacillariophyceae																						
Achnanthes spp.	8	6	7	4	1	3	1	1	5	2	12	2	3	4	13	11	4	5	5		10	13
Amphora sp.											2											
Asterionella formosa	2		3	7		20	17	8							43	3		28			42	
A. formosa var. *gracillum*			3		3					22												
A. spp.																						
Cocconeis sp.	.4												3									
Cyclotella glomerata	4	3	3	3	1	6	38	20	38	57	64	[illegible]	63	70	72			7			78	39
C. Meneghiana	2	3	.4	.4			1	1		4			3		5	8		2				
C. stelligera	1	3	1	12	2	4	1	3	5	5	4	9		4	11	3	4		5		10	
Cymatopleura sp.											2				3							
Cymbella sp.				.4	1	1	1				2	4		2	3					5		
Eunotia spp.		1		1	1		1		1	2	2				3			5	5	5		
Fragilaria crotonensis	1			.4	1				4		4		3			5	4			16	10	
F. sp.		1	1											4	16							
Gomphonema spp.	4	2	5	6	1	3	1		1	2	6				8					10		4
Hantzschia sp.																			5			
Melosira distans	13	16	7	23	7	17	29	28	17	24	107	62	50	37	19					16	10	4
M. granulata	.4	2	2	1	6	6	16	3	9	42	57	19	29	44	66	16	9	14	11	10	57	43
M. varians	1																					
Meridion circulare					1			3						2		5	9		5		21	13
Navicula spp.	4	7	5	5	1	2	5	1	9	7	21	22	13	9	8	8	9	5	16[a]	10	16	
Neidium sp.		.4				1																
Nitzschia acicularis	5	4	4	.4	2	3	4	2	1	2	1	2			3		4	9	5			13
N. obtusa var. *scalpelliformis*	1		1	1		1			1		1		2		3							
N. palea	1			1									2									2
N. sublinearis	3	5	5	4	2	1	3	2	3		21	12	5	4	3	5				5	20	1
Stauroneis spp.		1										4								5		
S. ...																	4					
S. phoenicenteron																	13					
Stephanodiscus Hantzschii										2												
Synedra ulna	1	4	4	5		2	1	3	1	4	6	4	8	7	11	3	4		5		21	17
Tabellaria fenestrata				3																		
Surirella sp.	1	1					3			2			5	2								
Unidentified pennates	2	3	.4		.4			2		4			5									
Cyanophyta																						
Chroococales																						
Anacystis thermale			3						7							8						
Agmenellum quadriduplicatum													10									
Hormogonales																						
Oscillatoria limosa														70								

[a]*Navicula cryptocephala* 11, *N. pupula* 5

UNITS = number per liter x 10^{-3}.

TABLE L-6. Phytoplankton species identified, Middle Black Warrior and Tombigbee Rivers, May 13 - 16, 1979.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Chlorophyta																						
Volvocales																						
Eudorina elegans						17				13												
Pandorina morum	16		7	7			7	7		13	8	11	16	11	33	12	66	83			131	
Gonium pectorale			3			5																
Unknown volvocalean cells	1				1	3	2	4		4	4	7	11		2						8	
Tetrasporales																						
Gloeocystis gigas							5		11				8		11				8	12		
Sphaerocystis Schroeteri	4																				262	
Chlorococcales																						
Micractiniaceae																						
Golenkinia sp.										0.4					1						4	2
Dictyosphaeriaceae																						
Dictyosphaerium pulchellum																					74	
Hydrodictyaceae																						
Pediastrum spp.																				17		14
Coelastraceae																						
Coelastrum microporum						14	7	11		3			32	5	5	24	33			33	33	14
Oocystaceae																						
Ankistrodesmus spp.	7	7	2	2	2	5	4	7	12	8	19	44	37	23	24	9	19	10	12	4	41	45
Chodatella spp.		2							1		0.5	2	2		1							
Closteriopsis longissima	0.5		0.4																			
Kirchneriella sp.	0.5							2		0.4		1	14	0.7	2		2					
Nephrocytium sp.									3													
Oocystis lacustris				1								8									16	
Quadrigula lacustris	4				2																	4
Tetraedron spp.			0.4					0.8		0.4	1		1						4		8	
Scenedesmaceae																						
Actinastrum Hantzschii		4				4		2						5		28						22
Crucigenia spp.									3		4	30	16	22	1	3						
Scenedesmus abundans																	58					
S. acuminatus																46	66					61
S. brasiliensis																						7
S. quadricauda							2									44	17	62		50	205	108
S. spp.	8	1	2			11		19	10	7	19	18		15	18	12			12	37	98	7
Tetrastrum spp.		2				5	2	10	10	5	10	14	8	3	5	9		42				14
Zygnematales																						
Desmidiaceae																						
Closterium gracile												1	1									
Spondylosium planum																					4	
Unknown chlorophytes	2	3	3	2	3	3	3	5	7	5	7	10	9		4	3	14	5	35	31	29	
Euglenophyta																						
Euglena sp.						1	0.4	2		0.4	0.5	1	2			2	2			1		
Phacus sp.														1							4	
Strombomonas sp.													1									
Trachelomonas sp.	0.5				0.4	1	0.4	0.4	6	3	0.5	1	30	6	5	6	10	5		6	4	11

UNITS = number per liter x 10^{-3}.

TABLE L-6. Continued.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Chyrsophyta																						
Chyrsophyceae																						
Dinobryon sp.														5								
Ophiocytium capitatum									2												4	
Bacillariophyceae																						
Achnanthes spp.	0.5					1	0.4			1		1		1	1		6		2	17		2
Amphora sp.						1																
Asterionella formosa	21	12	7	9	7	13	22	14	35			47	70	50	58	6						13
A. formosa var. *gracillima*									22	16	23	31	25									
Cyclotella glomerata		1		2	2	6	6	10	27	15	2	34	37	46	12				6	8		22
C. Meneghiana									2						4							
C. stelligera	4	2	1	2	2	3	1	4	8	5	4	7	6		13	6	12	16		10	37	4
Cymatopluera sp.												1										
Cymbella sp.	0.5			0.4													6		2	23		
Diatoma vulgare																	6					
Eunotia sp.										0.4												
Fragilaria crotonensis	9	3	2	3	2	10	20	27	2	9	3	27	39	56	53	5	14	10	6	8	29	9
Gyrosigma sp.																				4		
Melosira ambigua												3										
M. distans	20	17	9	8	3	11	4	5	12	7	22	34	28	14	35	54	215	52	20	56	66	56
M. granulata	8	14	9	5	2	3	26	14	21	11	24	49	116	71	61	16	64	10	45	21	61	56
M. varians				1	1				9		3			1	1						37	
Navicula sp.							0.4		1					1		1	14	31	6	6	8	4
Nitzschia spp.	3	2	0.4	1	0.4	4	2	2	7	1	2	1			1	2	2	16		10	25	7
Pluerosigma sp.										0.4										2		
Stephanodiscus sp.						2																
Surirella sp.								0.4						1								
Synedra spp.		1			0.4	1	1	0.4	5	1	5	1	3	1	3		8	5	12	2		9
Tabellaria spp.			0.4				1											10				
Unidentified pennate diatoms	4	1	1	2	2	2		0.4	9	0.4	1		3	1		4	12	16	18	12	16	2
Pyrrophyta																						
Peridinium sp.	1	0.5							2	1	3	1	5	2								
Cyanophyta																						
Chroococales																						
Agmenellum quadriduplicatum	8												125	19								
Anacystis spp. (colonies)		0.5									0.5		3	2	1							
Gomphosphaeria Wichuare (colonies)								2	2	2	1	5										
Hormogonales																						
Anabaina oscillarioidea																17						
Oscillatoria sp.														18			62				70	
Nostoc commune (Vauch) Drouet			2				14													17	111	14
Spirulina (filaments)		0.5																				
"Filament A" (cells)		4		7	11	24															29	

UNITS = number per liter x 10^{-3}.

TABLE L-7. Phytoplankton species identified, Middle Black Warrior and Tombigbee Rivers, June 17 - 20, 1979.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Chlorophyta																						
Volvocales																						
[illegible]																			1,000	1,680	952	
Te[illegible]																						
[illegible]																	151					
[illegible]																						842
[illegible]	284	604			4,21[illegible]	381	1,680	157	121	211	842		262	211			151			211		
Chlorococcales																						
Micra[illegible]																						
[illegible] spp.	213	75		26		95	105									61					48	
[illegible]	213		429			1,140						400	393	1,260								
Dictyosphaeriaceae																						
[illegible]		75	1,640	413	1,260	6,100	1,470	10,300	242		211	900	262		211	2,420				211	2,480	2,530
Ch[illegible]																						
Schroederia setigera			36	13	53				30	53	211	150	33		53	30			95			
Coelast[illegible]																						
[illegible]			571					314	970				262									
Oo[illegible]																						
[illegible]						762																
[illegible] *convolutus*	20,100	10,200	4,210	3,140	13,500	11,200	13,300	7,650	6,610	40,800	23,300	11,500	7,380	12,200	28,700	8,700	10,200	14,100	12,800	15,200	30,100	44,300
Chodatella spp.	71	38	18		158	143	53	78	61	211	316	250	197	158	105	30					190	
[illegible] *longissima*																	38				48	
[illegible] var. *major*																			762	474	333	316
[illegible] spp.				52													151	381	619			
[illegible]																	38					
[illegible]															211							
Tetra[illegible] spp.					53		53		30						105				48	53	48	
[illegible]			74				211		121			400										
Scenedesm[illegible]																						
[illegible] spp.							1,050		364			350		211		606	151			211		211
[illegible] spp.		453	196	129	632	2,520	1,890	541	789	1,320	842	800	328	211	684	303		667	857	316	381	211
[illegible] spp.			125	103	842	381		157	121	53										211		
Zygnematales																						
[illegible] sp.		38			53					53			33									
[illegible]											53	50	33									
Unidentified chlorophytes	426	340	357	219	1,420	1,190	1,050	1,610	1,240	1,260	842	65	852	2,000	947	364	264	381	571	684	714	368
Euglenophyta																						
[illegible] spp.								39				50					75					
Pyrr[illegible]																						
[illegible] spp.		37																48	190			
Chrysophyta																						
Chrysophyceae																						
[illegible]		75	18																			
[illegible]									30				33				38		48			

UNITS = number per liter x 10^{-3}.

TABLE L-7. Continued.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Bacillariophyceae																						
Achnanthes spp.			18	13																		
Asterionella formosa				90		48						400	98									211
Cyclotella glomerata	709				2,630	1,900	2,[illegible]	1,450	1,270	1,000	1,530	1,350	1,050	1,050	842	91	151	381	238	316	619	211
C. stelligera			18	39	53															53		53
Eunotia sp.						48																
Fragilaria sp.				13	316			39	91		53	50										
Gomphonema sp.			18																			
Gyrosigma sp.					53																	
Melosira distans			339	258	526	190		157	30			150										
M. granulata	922	528	286	297		238	105		121	368	632	600	951	579	1,530	273	830	48		153	1,000	789
Navicula spp.	71			26	105	95		31													48	
Nitzschia sp.				13			105															
Rhizosolenia sp.					53						53											
Synedra spp.		151		52	53	95								211	53						48	
Unidentified pennate diatoms				13	158	48					53	100	131	53	53	30	38				48	105
Cyanophyta																						
Chroococcales																						
[illegible] quadriduplicatum	1,700		643	52	2,740		842	471			526	2,000			3,370	485	453	571	2,480	8,639		
[illegible] sp. (colonies)		37	71	426	421		105	235		158	474	150	66		105	61	75	48	48	1,368	143	
[illegible] wichurae (cells)	567		143		368		842	3,450		842	421					364	302	667	762	421		53
Hormogonales																						
[illegible] circularis																		762				
[illegible] spp.				103				1,060				650			211		415				1,480	
"Filament A"	851		357	77	1,740		105		121	421			295	211								
[illegible] sp.								392			316					242						
[illegible]																		2,240				
Oscillatoria sp.	71														1,420				2,860			
[illegible] laxa						48																

UNITS = number per liter x 10^{-3}.

TABLE L-8. Phytoplankton species identified, Middle Black Warrior and Tombigbee Rivers, July 29 - August 1, 1979.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Chlorophyta																						
Volvocales																						
Eudorina elegans								339	86										156	98		976
Pandorina morum			89	70				254					116						156	98		163
Tetrasporales																						
Elakatothrix gelatinosa																13						
[illegible] compacta							110	42					174									
Sphaerocystis schroeteri			444	175	75	175				30	151		580		159	85	79	46	195	98	197	163
Chlorococcales																						
Micractiniaceae																						
Errerella bornhemiensis																				393	393	
[illegible] spp.				9		70	14	21		30	13	14		39	40			7		12	49	81
Micractinium pusillum							220			60	88		406	26	93		52	53			295	122
Dictyosphaeraceae																						
Dictyosphaerium pulchellum	305	148	89	376	830	281	910	772	599	338	252	338	696	206	53	39	26	582	253		459	
Characiaceae																						
Schroederia setigera	10	19	22		19	18	41	11	11		13		14	26	13	20		13	29	98	33	81
Hydrodictyaceae																						
[illegible] spp.	76						110		86	80		108	522	103								
[illegible]																						
[illegible] microporum			89			561		169		399	101	216		52	212	52			234		131	
[illegible]																						
A[illegible] nitzschii																52			58			
An[illegible] convolutus	2140	1810	2280	1420	3980	2210	1720	1430	1250	687	906	1570	1140	1160	1220	649	865	728	1180	1510	1790	2130
An[illegible] falcatus											25	41								12		41
Chlorella spp.				17		18	28	11	11						26		7	7	10			20
Closteriopsis longissima					19	35	14				13	14	14	13								
Kirchneriella obesa	76			35						80	101	54							39		66	81
Oocystis spp.	29			35			55	42				27				7						
[illegible]		37											14									
[illegible] spp.	29				19	18		21	11	10	13	41	29	26	[illegible]	[illegible]	[illegible]	46	[illegible]	135	[illegible]	[illegible]
[illegible] spp.						18		11		20	38		14	13		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	
Treub[illegible] triappendiculata			11						11	10					[illegible]	[illegible]		7			66	[illegible]
West[illegible] linearis											50											
Scenedesmaceae																						
[illegible] spp.			44	35	75	491	220	85	[illegible]	159	50	108	[illegible]	52		193	26	[illegible]	351	197	[illegible]	
Scenedesmus spp.	57	56	289	148	226	386	220	423	278	458	126	135	319	351	503	393	170	[illegible]	585	467	328	772
Tetrastrum spp.				35	151		55				50	54			53	79		[illegible]	39	49		
Zygnematales																						
Cosmarium sp.				9			55	21	11			27	14									
[illegible] binale											13											
[illegible] spp.															13				10			
Unidentified Chlorophytes	114	167	139	166	283	193	303	159	203		151	216	145	181	265	118	85	53	107	197	148	183

UNITS = number per liter x 10^{-3}.

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UNCLASSIFIED F/G 13/2 NL

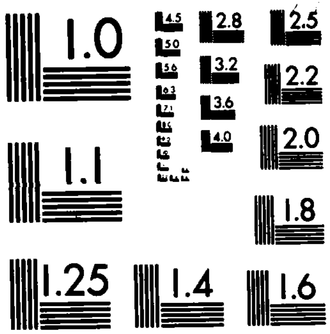
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TABLE L-8. Continued.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Euglenophyta																						
Euglena sp.		28	11	44	19	35	14	11			25		29	13	26	7	72	33	312	61	33	81
Phacus sp.									11							7			29		16	41
Trachelomonas spp.																		13	88	86		20
Chrysophyta																						
Chrysophyceae																						
Dinobryon spp.									11					13								
Ophiocytium capitatum				9			14	11											10			
Bacillariophyceae																						
Achnanthes spp.			22	26		18					13						7	6	10		66	
Cyclotella glomerata		333	378	367	811	4770	2530	2000	1800	2340	4360	2930	3450	4150	2320	59	98	126	58	12	1700	804
C. meneghiniana														13		13	7	6			16	203
C. stelligera	19		11	44	38	35	41	42	32	80	25	54	58	90	79	13	7		19	25	49	102
Cymbella sp.																	7	7				
Eunotia sp.	10																					
Fragilaria crotonensis					19					20	25				252						148	
Gomphonema sp.							14															
Melosira distans	57	37	111	201	38	105	55	42	43	50	88	68	72	206	199	33			136	85	164	224
M. granulata	114	565	167	227	774	246	124	286	193	199	289	365	217	129	212	20	26		10	12	115	407
Navicula spp.		9		9		18		11	11	30	13	27	14	25			20		10			
Nitzschia sp.								11	11		13							13		12		41
Rhizosolenia sp.														13							16	
Stephanodiscus sp.															13							
Surirella sp.												14										
Synedra spp.	38	37	11	9	94	70	83	138	43	80	38	41	116	39	132	26			78		115	20
Pyrrophyta																						
Peridinium sp.	10			9		35	41	21	53	20	25		101	52	26		7	13	10	49		41
Cyanophyta																						
Chroococcales																						
Agmenellum quadriduplicatum	2250	2190	3690	4750	5660	2880	331	254	1670	2150	3720	2000	3650	4180	2650	1180	236	900	2110	6240	2750	6590
Anacystis spp. (colonies)	152	176	78	131	226	368	193	95	96	119	151	176	217	155	265	39	13	106	107	270	279	589
Gomphosphaeria wichuare	76	222	178	114	264	280	220	254	599		302	162	116		106			53		295	787	325
Hormogonales																						
Anabaenopsis circularis				79		456	606	847	1140	597	277	1080	1100	1720	887						2980	
Anabaina oscillarioides														116					361	233	410	
Anabaina spiroides				35		35							261		252						197	
Arthrospira jenneri																52						
"Filament A"	19	83	67	280	453		234	21		199	805	1590	1970	1590	2370	20			712	1860	2480	3820
Nostoc commune										80	604				79	59						
Oscillatoria tenuis				280												1020	1880	1340	3160	2730		610

UNITS = number per liter x 10^{-3}.

TABLE L-9. Phytoplankton species identified, Middle Black Warrior and Tombigbee Rivers, August 26 - 29, 1979.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Chlorophyta																						
Volvocales																						
Eudorina elegans					337	198													152	458		
Pandorina morum		94		145	1010														303	343	119	
Tetrasporales																						
Elakatothrix spp.																41						
Schizochlamys compacta			54																			
Sphaerocystis Schroeteri	80	94	108	145							314				198		353		76	114	59	
Chlorococcales																						
Micratinaceae																						
Errerella bornhemiensis			432			691			762			632		2530								
Golenkinia spp.						25	53		48	25			24		25				9			20
Micractinium pusillum							632	431		346			94		74		20				178	
Dictyosphaeraceae																						
Dictyosphaerium puchellum	100	94	162	2040	4130	1190				74	1020		1040	105	1090	205	78	413	152	172	178	485
Characiaceae																						
Schroederia setigera				18	21							26	47		74			28	41	57	15	40
Hydrodictyaceae																						
Pediastrum spp.						395		314				421		211	988						119	
Coelastraceae																						
Coelastrum spp.	60			145							1250	211					78	110	152			162
Oocystaceae																						
Actinastrum Hantzschii														105								
Ankistrodesmus convolutus	2330	3240	2580	3620	3520	1160	2420	3020	3100	1700	4510	3550	1910	2180	2170	2190	2400	3070	1440	2790	2440	3660
Ankistrodesmus falcatus			14							25												
Chodatella spp.							105					105	48	53	25							
Closteriopsis longissima					21	49			48										9			
Gloeoactinium limneticum														105							119	
Kirchneriella spp.											627		94	53		82			208	57		
Oocystis spp.		12		36	21										99		78	14		14		40
Selenastrum spp.		47	41	18	84		53	118	48	74	157		24		49	21	78	95	95	14	44	162
Tetraedron spp.		106	27	164	42	148	53	195		25			24					41	9		15	
Treubaria triappendiculata			14			49		40	48	49	78	26		53			10	14		14	30	40
Westella linearis	80												94									
Scenedesmaceae																						
Crucigenia spp.			54		84			313		864	941			421		287	118	55	114	57	652	323
Scenedesmus spp.	40	94	216	255	800	494	632	627	1900	395	1250	474	424	579	790	226	157	206	398	229	356	323
Tetrastrum spp.	40				84				190	99	471	105	282	316	198				38			81
Zygnematales																						
Arthrodesmus incus	10																					
Cosmarium sp.				36		49		78														
Euastrum binale										25								14	9	14		20
Netrium digitus										25												
Staurastrum spp.					21								24							15		
Unidentified Chlorophytes	119	71	257	309	316	148	368	392	667	444		474	447	526	272	92	38	165	152	172	163	263

UNITS = number per liter x 10^{-3}.

TABLE L-9. Continued.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Euglenophyta																						
Euglena spp.							53	39	48	25	39	26		26	74	51	20	41	104	57	59	
Phacus sp.								39									10		9			
Trachelomonas spp.						26											10			14	15	
Chrysophyta																						
Chrysophyceae																						
Dinobryon spp.					21								24	26								
Ophiocytium capitatum			14										24		25							
Bacillariophyceae																						
Achnanthes spp.					63					25												
Capartogramma crucicula												26										
Cyclotella glomerata	20	12	203	164	1520	13,100	22,900	12,900	9100	4100	1180	1370	871	500	99	103	59	207	189	300	163	263
C. stelligera	1			18	21	74	53	39								21		28		57	15	81
Cymbella sp.		12																				
Fragilaria crotonensis	80	71	54	73	126	173	53		95	49			24			10			9	29		
Gomphonema sp.																						
Melosira distans	20					74	105	78			78		94		148	62		165	47	114	74	40
M. granulata	30	24	202		547	1140	1110	471	1430	346	902	526	941	711	395	226	255	69	369	315	252	525
Navicula spp.					21							26				10					44	20
Nitzschia spp.		24		48	42	49	53	39	48	49							10	28	9	14		
Surirella sp.		12																				
Synedra spp.				18		914	1580	392	95	469					49						59	40
Unidentified Pennates			14	18	21	49					39		24		24	31	29	14		29	44	40
Pyrrophyta																						
Peridinium sp.		12	14	18	42	123	263	275	286		157	53	71	26	49	51	29	14	57	72	30	141
Cyanophyta																						
Chroococcales																						
Agmenellum quadriduplicatum	3620	2120	12,500	15,000	8840	4640	14,900	14,000	23,000	8,000	42,400	40,600	46,300	69,700	74,800		314	1270	3300	2050	9660	6790
Anacystis spp. (colonies)	119	35	203	109	358	148	211	353	1100	494	1300	632	541	447	247	123	88	55	57	72	59	303
Gomphosphaeria wichuare	80		324	255	168			627	1140	198	941	211	376									
Hormogonales																						
Anabaenopsis circularis								627	333						148					386		
Anabaena oscillarioides																82	314			200		485
Anabaena spiroides																						1100
"Filament A"		365	176		189	99			1520	99	1100	289	1080	605	716	82	559		350	1600	770	1600
Lyngbya contorta																					296	
Nostoc commune											588	53				236						
Oscillatoria tenuis																174	196					
Raphidiopsis curvata			122			222	632	2120	1810	1430	353	237						165			356	303

UNITS = number per liter x 10^{-3}.

TABLE L-10. Phytoplankton species identified, Middle Black Warrior and Tombigbee Rivers, October 1 - 3, 1979.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Chlorophyta																						
Volvocales																						
Pandorina morum							130															
Tetrasporales																						
Sphaerocystis Schroeteri							195					1,170			211							1,490
Chlorococcales																						
Micratinaceae																						
Errerella bornhemiensis										1,480												
Golenkinia spp.			10						23		20				53		86	15		51	24	263
Micractinium pusillum			50												211		64	302	46	606		
Dictyosphaeraceae																						
Dictyosphaerium pulchellum																	86			303	95	
Characiaceae																						
Schroderia setigera			10												53			15	23		24	
Hydrodictyaceae																						
Pediastrum tetras																				202		
Coelastraceae																						
Coelastrum microporum															316			121	913		381	
Oocystaceae																						
Ankistrodesmus convolutus	4,090	2,950	2,790	5,000	2,860	4,340	4,260	7,380	6,020	5,860	5,030	16,300	17,600	18,700	16,300	18,000	5,710	3,720	6,190	15,100	5,380	24,900
Ankistrodesmus falcatus						32							56				21					
Chodatella spp.		12	26	19			16		23		20							45				
Closteriopsis longissima																	21					
Kirchneriella obesa																		91	228			
Selenastrum spp.	16	12	20	19	33		16	27	46		485			136	53		43	121	68	51		
Tetraëdron spp.	16	12			22		33	27		23	20			68		62	21	15				88
Treubaria triappendiculata					11		16															
Westella linearis							130															
Scenedesmaceae																						
Crucigenia spp.								216	230		162				211		86	181			619	
Scenedesmus spp.	124	24	20	154	110	64	65	364	46	46	81	234		272	211		215	363	320	303	238	702
Tetrastrum spp.				77				108				234				247	86		160		95	
Zygnematales																						
Arthrodesmus incus										23		59									24	
Cosmarium sp.	16				11							59										
Unidentified Chlorophytes	109	153	119	115	77	112	81	81	46	162	101	175	158	136	263	62	102	91	160	152	167	89
Euglenophyta																						
Euglena sp.	31	24	20	38			49	27	46		61						21	15			24	88

UNITS = number per liter x 10^{-3}.

TABLE L-10. Continued.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Chrysophyta																						
Chrysophyceae																						
Dinobryon bavaricum			30																			
Bacillariophyceae																						
Achnanthes spp.	31			19	11			27			20				53		21	45	23	51		
Asterionella formosa							65															
Cyclotella glomerata	16																				476	
C. stelligera							49	27		23								15				
Fragilaria crotonensis						16			46					136	53							
Melosira distans	140	259	139	308	220	256	260	378	736	486	242	234	368	816	947	123	172	76	300	253	429	526
M. granulata	202	165	139	77	275	32	49	135	46	602	485	117	53	68	263			15	228	202	238	88
Navicula spp.	31	12		38		16		27								62		15	23	51	24	
Nitzschia sp.				19		16			46		20	58		68	105					51		
Rhizosolenia sp.			10		11																24	
Stephanodiscus sp.	16									23									23			
Synedra spp.		12	10		44		16	27	23	23		117		136	684	62			68			88
Pyrrophyta																						
Peridinium sp.																					24	
Cyanophyta																						
Chroococcales																						
Agmenellum quadriduplicatum	620	329	716	846	967	640	455	216	2,020	556	404	936	1,260	3,270	421		258	363	822	505	762	2,810
Anacystis spp. (colonies)	16	59	20	38	99	16	16	162	69	46	121	117	105	408	421	185	86	106	68	101	143	526
Gomphosphaeria wichuare																494			114			
Hormogonales																						
Anabaenopsis circularis																						3,160
Anabaina oscillarioides						320		1,140	828						1,160						452	1,050
"Filament A"	31						33					1,170	1,580	2,650	2,420	617	172	15	300		476	702
Nostoc commune	93	24			154	448		135		46					316						286	
Oscillatoria sp.																			160			
Spirulina sp.		12																				

UNITS = number per liter x 10^{-3}.

APPENDIX M

ZOOPLANKTON

TABLE M-1. Zooplankton taxa identified, Middle Black Warrior-Tombigbee Rivers, July 30 - August 4, 1978.

TAXA \ STATION NO.	1	2	3	4	5	6	7	9	10	12	13	14	15	16	17	18	19	20	21	23
PROTOZOA																				
Actinophrys sp.				1									1		5	12				
Arcella sp.		<1	1		7															
Difflugia sp.		1		<1	3							<1			7	66	<1	<1	<1	
Rhizochrysis sp.			1																	
ROTIFERA																				
Asplancha sp.	1	2	6	5	59	5	5								1	2	2	<1	3	3
Branchionus calyciflorus		2					70	129	260	186	42			32	223	320	51		14	40
Branchionus spp.	<1		4	7	7	18	10	12	20	11	8	13	20	5	21	16	15	7	3	7
Conochilus sp.				<1											22			<1		
Conochiloides dossuarius						58	21	32	57	30	26	15	23				27	8	4	
Conochiloides sp.												<1		19		23				12
Filinia sp.				<1	1											20	<1			
Keratella cochlearis	5	4	6	11	154	65				23			23							
Keratella spp.						7	3	5	9	10	12	10	5	7	13	4	1		<1	6
Kellicottia sp.				<1	1															
Lecane sp.						1		3				<1								
Monostyla sp.											1								<1	<1
Platyias sp.																			5	12
Polyarthra trigla	1	1	5	15	169	<1				8	21	2	41	22	74	106	8	4		
Trichocerca sp.																	<1	<1		
Unidentified rotifer	1			<1														<1		
CLADOCERA																				
Bosmina longirostris	7	1	2	<1	3	2	7	13	26	4	5	11	10	5	1			<1	1	33
Diaphanosoma brachyurum												14						41	16	32
Diaphanosoma sp.	<1		1			2	4	6	40	10	4		7	14		2	3			
Daphnia sp.	1	1	2				<1				1								4	3
Juveniles									1							68	5	2		
COPEPODA																				
Attheyella sp.							1				<1	<1	1	2				<1	<1	
Cyclops sp.	1	<1	1	1					3			<1		1		4		4	2	2
Diaptomus sp.						3	<1	2	7	4	2	3	2	3				1	2	4
Nauplii and Metanauplii	29	29	51	43	19	35	44	37	23	23	6	8	16	8	19	14	5	7	15	21
OTHER ZOOPLANKTON			1	1	1	<1	1				1	<1	<1		2				<1	

UNITS = number per liter.

TABLE M-2. Zooplankton taxa identified, Middle Black Warrior-Tombigbee Rivers, August 27 - 31, 1978.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	17	18	19	20	21	22	23
PROTOZOA																					
Actinophrys sp.													1			1	4	10	4		
Amoeba sp.	<1																				
Arcella sp.	1																				
Difflugia sp.				1	2		1	1			1				3	8	6	2			
ROTIFERA																					
Asplanchna sp.	<1	<1				1	1					1	1	4	1	<1	6	1		3	
Branchionus angularis							2	1	9			2			20	36	43	18	20		
B. calyciflorus						33	25	27	142		45	27	19		61					16	
B. spp.	1	<1	1	3	2				6	34	5		2	25							6
Conochiloides spp.	3	<1									1	5	20	22		<1		8		1	
Conochilus hippocrepis	47	82	83	66	29	65	7		12	13	46	32	22	76		21	53	14	46	34	
C. spp.								1							7		<1		3		2
Filinia sp.	<1					1	1														
Hexarthra sp.																8	6	<1	18	21	8
Keratella cochlearis				28	7								8								
K. spp.	9	8	21	3	6	1	3	3	4	3	7	12		6	11			1		5	2
Monostyla sp.									3		1							<1			<1
Mytilliana sp.																		<1			
Platyias sp.							1	1	1	1	3	1	10	4	<1						<1
Polyarthra trigla		<1	4	1		3	2	1	19	47	20	9	18	15	17	9	3	2	23	5	2
Trichocerca sp.											1		1	1			<1	<1			
CLADOCERA																					
Bosmina longirostris	3	7	15	16	13	26	38	73	138	68	42	10	38	81	<1		<1	<1	1	10	26
Daphnia sp.			1	1	1	1						2									3
Diaphanosoma brachyurum	20	14	39	17	34	30	23	18	23	6	4	22	4	19	1		8	7	4	11	
Moina sp.				3	5	2															
Moinodaphnia sp.	1		5	1			3	1		3		1						<1	1		5
COPEPODA																					
Cyclops sp.	2	<1	2		1	1	1	2	3	1	2		1	4	<1		1	3	3	2	4
Diaptomus sp. ?	26	5	17	13	32		11	11	13	15	2	8	3		1						3
Nauplii and Metanauplii	36		37	50	120	79	48	26	67	33	23	25	27	27	20	23	9	11	35	16	25
OTHER ZOOPLANKTERS	1				1	1				1		1	1			1	1	1	1	<1	

NOTE: Sample collected at Station 16 was spilled in transport.

UNITS = number per liter.

TABLE M-3. Zooplankton taxa identified, Black Warrior-Tombigbee Rivers, October 1 - 5, 1978.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
PROTOZOA																						
Actiniosphaerium sp.									1	<1	<1	<1	<1			<1				9		1
Difflugia sp.								1		1	1							8	<1			
Paramecium sp.										<1												
ROTIFERA																						
Asplancha sp.	<1			<1	3					<1	<1		4			<1	1		<1	9		
Brachionus spp.	1	<1	<1	<1	1	9	18	29	8	4	4	5	3	4	5	1	6	3	<1	4	7	3
B. angularis													4	6			7	11		18		
B. havanensis																	2	2		3		
Conochiloides exogius	<1	1	28	18	16	1		1	2	1	3						1	<1	2		1	<1
Conochilus unicornus					116	140	38	106	47	27	7	1	1	1	<1	31	84	60	<1	58	2	1
Enteroplea [illegible]					71	6					6	1	1	2	<1	5	21	9	5	13	5	4
Filinia sp.						1			1	<1		1		<1	<1							
Hexarthra mira	<1		4	1	7	6	2	12	4	7	5	15	6	8	9	<1	3	6	4	7	6	13
Keratella spp.	1	2	8[a]	12[a]		7	3	6	2	2	7	5	5	2	3	1	2	2	<1	1	10	4
Lecane sp.						1																
Monostyla sp.	<1			<1																	1	
Platyias sp.								1							<1		1			2	3	<1
Ploesoma sp.					1		1				3	1	1	<1			1	<1		1		<1
Polyarthra trigla		1		<1	3	8	5	29	11	12	19	14	6	7	5	1	3	2	4	1	28	5
Trichocerca longiseta		<1		<1						<1	1	1	1				2	1	<1			
CLADOCERA																						
Bosmina longirostris	1	8	4	4	7	23	62	130	40	23	9	18	20	23	36	2	1	<1	2	1	48	29
Daphnia sp.		<1		<1		1													1	2		2
Diaphanosoma sp.	1	4	2	3	2	7	7	11	4	8	1	5		7	8	1	2	2	5[b]		12	9
Moniodaphnia sp. (?) (cf. *Ceriodaphnia*)		<1			<1	<1		1		1						2	2	2	2			
COPEPODA																						
Cyclops sp.		1	1	1	2	1	1		1	6	2	1	1	1	2	1	2	4	1	1	6	2
Diaptomus sp.	7	29	5	9		1	2	7	2	7	6	1	1	4	3	5	2	3	2	2	5	3
Nauplii and Metanauplii		17	26	24	8	9	38	41	26	19	12	11	9	17	20	22	17		15	26	33	26
OTHER ZOOPLANKTERS	10																					<1

[a] *Keratella cochlearis*

[b] *Diphanosoma brachyurum*

UNITS = number per liter.

TABLE M-4. Zooplankton taxa identified, Middle Black Warrior-Tombigbee Rivers, December 10 - 14, 1978.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Protozoa																						
Ceratium hirudinella	<1		2	4	<1	1	<1	<1	<1	<1	<1	<1	<1	<1					1			
Difflugia sp.			<1		<1										<1							
Epistylis sp.				1											2							
Rotifera																						
Asplancha sp.	1		<1	<1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1			<1	1	1	1	
Brachionus spp.			<1		<1	<1	<1				<1				<1		<1	<1		3	2	1
Conochiloides exoginus			<1					<1	<1	<1	<1	8	6	8	6							
Conochilus unicornis							<1	<1	1	1	1	4	2	2		1		<1	36		7	3
Enteroplea lacustris		1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	6	1	4	1	<1	3	6	8	8	6
Filinia longiseta											<1	4								1	<1	
Hexarthra mira	<1																	<1	2	<1		<1
Kellicottia longispina			1	1	<1	1	<1	<1	1	1	<1	<1	<1	<1	<1	1		<1	3	<1	<1	<1
Keratella spp.	1	<1	<1	<1	<1	<1	<1	<1	1	1	1	3	3	3	3	1	<1	1	19	7	1	
Lecane sp.		<1						<1		<1										<1		
Monostyla spp.	<1					<1	<1	<1	<1		<1	<1								<1		
Platyias spp.								<1							<1			<1		<1	<1	<1
Ploesoma sp.								<1					1									
Polyarthra trigla	<1	<1	<1	<1	<1	<1	1	<1	<1	<1		3	3	3	2	1	<1	2	6	4	2	3
Synchaeta sp.													1	<1	1				1	2	1	1
Trichotria sp.				<1	<1	<1	<1		<1	<1												
Cladocera																						
Allonella sp.			<1			<1	<1	<1													<1	
Bosmina longirostris	2	3	1	2	1	2	1	1	2	3	2	19	26	21	21		<1	1			6	
Ceriodaphnia sp.		<1		<1		<1	<1	<1		<1	<1	<1				1	<1	<1	1	<1	<1	
Daphnia sp.		<1				<1		<1	<1		<1		1	<1								
Diaphanosoma sp.	1	<1	<1	1	<1	<1		<	<1	<1	1	<1	<1	1			<1		<1	<1		1
Macrothrix sp.																					<1	
Copepoda																						
Cyclops spp.		1	1	1		1	<1	<1	1	<1	<1		1	<1	<1		<1	2	21	2	1	2
Diaptomus		1	1	1	<1	1	<1	<1	1	<1	1	1	1		1		<1	1	1	1	<1	1
Nauplii and Metanauplii	4	4	3	3	1	3	3	3	5	4	3	6	8	8	5	4	2	14	23	11	11	1
Other zooplankton	<1	<1	<1	1	1	<1	1	<1	<1	<1	<1	<1				<1	<1			<1		

UNITS = number per liter.

TABLE M-5. Zooplankton taxa identified, Black Warrior and Tombigbee Rivers, February 27 - March 2, 1979.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Protoza																						
Ceratium hirundinella	0.08		0.04					0.05	0.1		0.04											
Difflugia sp.									0.05													
Vorticella sp.		0.2					0.6	0.05	0.1		0.04			0.05						0.1	0.04	
Rotifera																						
Asplanchna priodonta	0.1			0.2	0.4	0.3	0.06		0.3	0.4			0.04	0.05	0.04	0.03	0.06	0.2	0.03			0.1
Brachionus angularis																0.5		2	0.3		0.2	
B. calyciflorus																0.2		0.2	0.1		0.5	0.5
B. spp.	0.2	0.08	0.04		0.05	0.1	0.1	0.1	0.2								0.8			0.5		
Cephalodella sp.		0.08																				
Conochiloides sp.		0.08		0.04			0.2		0.2												0.04	
Euteroplea lacustris		0.2	0.04		0.05	0.1	0.06		0.1							0.06	0.2		0.03			
Filinia longiseta	0.6	0.4	0.3	0.08	0.05	0.1	0.18	0.4	0.5							0.3	0.6	1	0.2	0.6	0.3	0.06
Kellicottia longispina	0.04	0.04	0.2	0.04	0.15	0.3	0.4	0.2	0.2	0.04	0.04		0.08	0.1		0.12		0.06		0.1	0.04	0.03
Keratella cochlearis	0.2	0.3	0.08	0.2	0.1	0.1	0.06	0.3	0.8	0.08	0.04		0.04			0.2	1.2	0.9	0.09	0.8	0.1	
Lecane sp.					0.05											0.06		0.2			0.08	0.03
Notholca acuminata	0.04			0.08	0.05	0.03		0.05	0.05	0.08		0.1			0.							
Ploesoma sp.		0.04	0.04					0.05														
Polyarthra trigla	0.9	0.5	0.08	0.04	0.5	0.2	0.2	0.8	0.9	0.1	0.04					0.03	0.2	0.1			0.1	0.09
Synchaeta pectinata	0.4	0.4	0.4	0.2	0.6	0.7	1.4	1	0.55	0.1	0.08		0.08	0.3	0.08	0.7	1	3	0.5	0.8	0.7	0.3
S. stylata		0.1				0.1											0.2		0.1		0.2	
Trichotria sp.					0.1		0.06	0.05														
Cladocera																						
Alona ? sp.	0.04								0.05								0.06				0.04	
Bosmina longirostris	0.04	0.04	0.2	0.04	0.6			0.7			0.4	0.4	0.4	0.7	0.4	0.5	0.6	0.6	0.1	0.3	0.4	0.2
Daphnia sp.							0.06	0.1	0.05	0.08			0.08			0.03	0.06					0.03
Copepoda																						
Cyclops sp.	0.4	0.2	0.3	0.12	0.3	0.4[1]	0.2	0.2	0.2	0.04	0.08	0.06	0.04	0.1		0.2	0.12	1	0.3	0.3	0.1	0.2
Diaptomus sp.	0.2	0.1	0.2	0.08	0.2	0.2	0.2	0.1	0.05	0.08	0.08	0.06	0.04	0.2	0.08	0.2		0.06		0.05	0.1	0.1
Nauplii and Metanauplii	2	2	1	0.5	3	1	2	3	4	1	0.08	0.5	0.5	0.4	0.3	0.8	3	4	1	1	1	1
Other Zooplankton*	0.08		0.16	1.2	0.2	0.1	0.2	0.3	0.05	0.2	0.2	0.3	0.3	0.3	0.04	2	0.8	4	2	2	1	1

[1] Cyclops sp. ? (.3) & Mesocyclops edax (.1)

*A 60/40 mix of nematodes and oligochaetes

UNITS = number per liter.

TABLE M-6. Zooplankton taxa identified, Middle Black Warrior-Tombigbee Rivers, May 13 - 16, 1979.

TAXA / STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Protozoa																						
Actinophrys sol		1	0.3		0.2	0.4	0.4	1	2	1	2		1	0.5				0.1		3	1	1
Ceratium hirudinella	5	8	3	2	3	2	4	0.2	0.4	5			2	12		2	11	5	12	6	1	1
Difflugia sp.								0.2	1			1		0.5								
Epistylis niagare	4			4						21	7											
Vorticella sp.																			2			
Rotifera																						
Asplanchna priodonta	8	6	2	2	1	2	2	3	4	3	5	3	1	2	3	2	1	1	1	1	1	2
B. spp.				0.3	0.5	4			0.4	1		2	4	4	3	4	2	2	5	3	9	4
Cephalodella sp.					0.3				0.4					1								
Conochiloides spp.	3	1	3	1	1	2	2	2	3	8	2	1	7	17	3		0.4	1	2	3	6	1
Conochilus unicornis	21	11	8	5	4	10	10	10	21	19	47	22	42	23	30	5	3	3	9	13	25	21
Enteroplea lacustris						1		0.4	1													
Filinia longiseta																0.4		0.1	2	1	2	2
Gastropus sp.				2	1	5	2	1	3		5	5	1	0.5	2						0.5	
Hexarthra mira																				0.2	0.5	1
Kellicottia bostoniensis	1		0.3	3	0.5	0.4		0.2	0.4	2	2	2	2	0.5	1	1	1	1	3	3	2	1
Keratella cochlearis	27	20	14	15	14	[illegible]	26	8	26	45	68	58	38	24	35	9	8	8	14	20	18	25
Lecane sp.																0.2	0.3		0.3			
Monostyla sp.																				5		
Notholca striata																						
Platyias spp.																		0.3		1		1
Pleosoma sp.		1										3	2		2		0.3			5	2	
Polyarthra trigla	45	17	24	20	20	25	33	20	45	79	119	87	54	30	62	4	1	2	1	4	16	26
Synchaeta spp.	13	17	17	14	22	30	32	17	34	53	31	48	74	43	91	6	5	4	8	14	29	35
Trichocerca sp.														0.5		0.2				0.2		
Trichotria spp.					0.3				0.4								0.3	1		1	0.5	
Pliomate rotifer (male?)		1	0.3	0.3		1	2	1	4	5	5			1.5						2		
Bdelloid rotifer																			6	1		
Cladocera																						
Bosmina longirostris	31	21	27	21	14	11	12	7	12	17	16	16	13	14	29	3	2	4	2	4	10	10
Ceriodaphnia sp.																					1	0.5
Daphnia sp.			1	1		0.4	0.4	0.2						0.5			0.1		1	0.2		
Diaphanosoma brachyurum	1	5	3	2	1	1	0.4										0.3					
Holopedium amazonicum		0.4	1	1	1	0.4			0.4	1				0.5								
Eurycercus sp.																			0.3			0.5
Ostracoda																						0.5
Copepoda																						
Cyclops spp.	3	1	3	4	2	1	2	0.2	0.5	3	2	5	1	1	1	4	2	1	7			3
Diaptomus sp.				1	1	1	1	0.2	1			2	1	0.5								
Calanoid copepoda																			3	2	1	0.5
Cyclopoid copepoda																		1	7	4	2	
Nauplii and Metanauplii	12	17	11	8	12	10	15	6	10	19	18	10	14	5	17	9	7	7	21	13	12	14

UNITS = number per liter.

TABLE M-7. Zooplankton taxa identified, Black Warrior and Tombigbee Rivers, June 17 - 20, 1979.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Protozoa																						
Actinophrys sp.	<1					104	1									5	3	5		4	8	
Ceratium hirundinella	3	1	19	20	95	36	34	13	4	10	70	114	155	36		2	3	1		1	25	8
Difflugia sp.	2	<1		<1					2		2	2		1	2	1	1			1	3	1
Epistylis niagarae	2				18					1		40	30								9	
Vorticella sp.	1	<1	1				1															
Rotifera																						
Asplanchna priodonta						6	8	6	4			4	2	1	5	13	13	7	19	11	29	6
Brachionus spp.		<1				4	1	1	12	2	13	12	4	9	12	4	5	9	3	5	15	8
Cephalodella sp.	<1																					
Conochiloides sp.	<1						7	6	16	10	10	8	6	8	2	3	6	3	<1	2	1	
Conochilus unicornis				1	5	76	124	110	132	182	321	166	76	58	30	9	20	17	9	22	19	9
Filinia longiseta					1	18	4	3		4			2	1		1	2	6	1	3	8	2
Gastropus sp.	2	1	2	3	16	54	15	4	8	12	13	23	22	9	12	<1	<1	1		2	7	
Hexarthra mira		<1				4	3	1	2	1	2	4	4	1	2			<1		6	16	2
Kellicottia bostoniensis						2							2			<1	1	1				
Keratella cochlearis	11	11	32	27	129	106	129	79	128	79	184	177	181	138	259	22	16	21	13	16	162	62
Lecane sp.		<1													3							
Monostyla sp.	<1	<1			1	2							2		2							
Notholca sp.																<1						
Platyias sp.														1			1		1			1
Ploesoma spp.	<1					4	20	6	23	22	36	67	34	72	54	<1	1	1	1	8	58	14
Polyarthra trigla	5	7	17	27	84	174	100	79	246	84	163	96	84	96	83	16	21	5	25	28	67	48
Synchaeta sp.						72	2			4			2		2	21	20	20	24	30	1	10
Trichocerca sp.						2	1				2		2	1	3	1		<1	1	2		1
Bdelloids		<1		1									2			<1	1	1		2		
Unidentified ploimates																			1	1	1	
Cladocera																						
Bosmina longirostris	1	2	4	4	8	8	32	13	10	5	53	40	32	40	37	1	1	1	1	1	43	7
Daphnia spp.	1		2	1	2		1				2			1		<1		<1	<1			
Diaphanosoma brachyurum	1	<1	3	4	5	28	4	6	10	6	2	6	4	14	22	2	1	1			25	6
Holopedium amazonicum	<1		1		1																	1
Ceriodaphnia sp.											4	2		4	3	3	3	3	3	4	5	1
Copepoda																						
Cyclopoida	2	1	5	5	6	14	4	5	10	5	4		2	6	5	2	1	1	1	1		6
Diaptomus sp.	3	3	14	5	42	12	1	4	10	13	8		14	1	10	<1	1	<1		1	4	3
Nauplii and Metanauplii	23	17	42	43	80	42	45	28	19	30	23	48	62	24	73	6	11	6	4	1	51	18

Units = number per liter

TABLE M-8. Zooplankton taxa identified, Middle Black Warrior and Tombigee Rivers, July 29 - August 1, 1979.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Protozoa																						
Actinophyrs sol						<1	<1	1	<1	<1	<1	4		<1	1	<1	1	<1		7	3	3
Actinosphaerium sp.										<1		<1										
Arcella sp.									<1	<1												
Ceratium hirudinella			<1	<1	<1				<1						<1							
Difflugia	<1	<1	<1	<1	<1	<1	<1		<1	<1	<1			<1		<1	1	<1			<1	<1
Vorticella sp.		<1	<1	<1							<1			<1	<1	<1						
Rotifera																						
Asplancha priodonta						<1		<1	<1				1	<1	<1	<1	<1	<1	1	2	2	2
Brachionus angularis							1	<1	<1	1		2	3	2	2	3	2	<1	<1	3	2	2
B. calyciflorus															1	2	4	1	3	4	2	2
B. caudatus		<1				4	2	3	5	3	2	2	5	6	4	1	<1	<1	<1	1	3	3
B. havanensis																						<1
Cephalodella sp.											<1						<1					
Conochiloides exiguus	<1	<1		<1	2	5	1	3	<1	1	3	5	<1	2	3	<1	<1	1	1	1	1	1
Conochilus hippocrepis				<1	2	<1																
C. unicornis	<1	1	4	3	25	24	31	32	15	14	23	40	23	25	15	3	2	1	<1	1	14	7
Filinia longiseta		<1	<1	<1	4	<1	<1	<1	<1	<1	<1		<1	<1		<1	<1					
Gastropus sp.	<1		<1	<1	3	<1	<1	5	4	5	7	8	4	2	1	<1		<1	<1	1	2	<1
Hexarthra mira	<1	1	2	<1	20	8	4	5	2	2	2	4	3	6	2	2	<1	<1			<1	<1
Kellicottia bostoniensis				<1			<1	1	<1						<1	<1	<1	<1				
Keratella cochlearis	4	2	3	2	20	13	13	18	18	12	16	17	20	14	7	2	2	1	2	4	6	4
Lecane sp.																		<1				
Monostyla sp.																					<1	
Notholca sp.					<1																	
Platyias sp.									<1				<1	<1	<1	<1	<1	<1	<1	<1	<1	
Pleosoma spp.	<1	<1			<1	5	6	15	9	15	3	5	6	7	4		<1				1	1
Polyarthra trigla	<1	1	<1	<1	12	3	3	5	6	3	2	6	12	4	2	4	2	4	3	5	5	8
Synchaeta stylata	<1			<1	1	11	5	4	2	2	3	12	25	12	5	18	7	13	10	16	9	11
Trichocerca			<1	<1	<1		<1								<1	<1	<1					
Unidentified Ploimates	<1				2	<1	<1	3	<1	2	2	<1	1	<1	<1	<1					<1	<1
Bdelloid Rotifers									<1		<1	<1	<1									
Cladocera																						
Bosmina longirostris	2	1	2	2	9	6	9	6	4	9	8	7	6	3	2	<1	<1	<1			3	<1
Ceriodaphnia lacustris	<1	<1				<1										<1	<1		<1			
Daphnia spp.							<1	<1	<1					<1		<1	<1	<1	<1	2	<1	<1
Diaphanosoma brachyurum	1	3	1	<1	2	<1	1	1	<1	1	1	3	3	3	5	<1	1	<1	<1	<1	4	2
Holopedium amazonicum								<1					<1				<1					
Copepoda																						
Cyclopoida		<1	<1	<1	3	3	<1	2	<1	<1	2	3	1	2	2	1	<1	<1	<1	<1	1	<1
Diaptomus sp.	7	7	6	2	13	5	4	2	<1	2	4	4	2	4	2	<1	<1	<1			3	1
Nauplii and Metanauplii	22	26	17	8	10	1	4	3	2	<1	3	4	7	4	3	1	2	<1	<1	1	4	3
Other Zooplankters					<1		<1									<1	<1		<1	1		

UNITS = organisms per liter.

TABLE M-9. Zooplankton taxa identified, Middle Black Warrior-Tombigbee Rivers, August 26 - 29, 1979.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Protozoa																						
Arcella sp.																		<1				
Actinophrys sp	<1														<1	1	<1	1	1			
Difflugia sp.	<1	<1	5	3	8		1	1	1	1	1	1	<1		<1	2	5	1	1	7	5	4
Vorticella sp.																<1				<1		
Rotifera																						
Asplanchna priodonta			1			1		1	6		<1		1		1	4	1	<1	2	4	1	4
Ascomorpha sp.					2											<1		<1	<1			
Brachionus angularis					2	1	1	1	3	1	3	1	1	2	2	2		1	2	4	5	7
B. calyciflorus						1	2	1		2						4	3	1		4	4	7
B. caudatus		<1	1	1	8	7	8	8	24	8	5	6	3	5	2	1		<1		2	8	2
B. havanaensis					2													<1				
Conochiloides exiguus	1	1	1	3	31	1					<1		<1	<1	2	2	3	7	12	8	8	10
Conochilus unicornis	3	10	16	15	101	13	7	14	27	29	3	1	1	2	2	21	20	1	4	13	14	15
C. hippocrepis																	1		1			
Filinia longiseta						1			1	2	2	2						<1		<1		
Gastropus sp.			2	2	5	1					<1											
Hexarthra mira		1	3	1	9	3		1	1	1	5	7	2	1	1	12	7	1	2	<1	3	4
Kellicottia bostoniensis																	1					
Keratella cochlearis	16	20	88	54	268	133	172	83	195	101	71	77	39	52	53	9	6	2	4	1	11	12
Lecane sp.	<1																	<1				
Manfredium eudactylotum						1																
Monostyla sp.	<1			1																		
Platyias sp.								1		1					<1		<1		1	1	1	
Ploesoma sp.		<1				5	30	10	51	20	2	1	<1	<1	1			1	9	4	4	
Polyarthra trigla	<1	<1	2	12	16	30	85	67	53	62	18	6	2	2	4	19	26	10	51	22	13	15
Synchaeta sp.							4	3	3		3		<1	<1	<1	8	10	9	8	8	3	6
Trichocerca spp.								1					1	<1	<1	<1		<1	2	1	1	1
Unidentified rotifers						9							1	1	<1						1	
Cladocera																						
Bosmina longirostris	<1	<1	1	<1	2	1	6	1	6	13	7	5	6	5	7					1	8	3
Ceriodaphnia lacustris		<1					1	1			<1	<1	1		2	1		1	3	14	6	6
Daphnia sp.				<1		1									<1	<1	1	9	2	2	1	
Diaphanosoma brachyurum	1	6	7	1	20	9	8	9	17	3	4	12	15	9	16	12	14	4	9	6	16	19
Moina macrocopa								1													1	1
Copepoda																						
Cyclopoida	<1	2	1	2			1	1			2	2	2	2	1	3	5	4	6	8	5	5
Diaptomus sp.	1	3	4	2	9	18	7	3	6	10	2	6	6	9	8	2	2	1	2	4	4	6
Nauplii and Metanauplii	7	11	21	22	59	19	24	21	27	29	31	22	21	20	23	12	16	18	21	28	26	31
Other zooplankters																	2	1			1	1

UNITS = organisms per liter.

TABLE M-10. Zooplankton taxa identified, Middle Black Warrior-Tombigbee Rivers, October 1 - 3, 1979.

TAXA \ STATION	1	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17	18	19	20	21	22	23
Protozoa																						
Actinophrys sol																<1	1	<1	5	2	1	1
Arcella sp.				<1									<1		<1							
Ceratium hirundinella	<1	1	<1	<1	2		<1	1	<1	<1	<1	<1	3	3	2	<1	<1	<1	3	<1		8
Centropyxis sp.										<1	<1	<1				<1	<1	<1				
Difflugia sp.	1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1		<1	<1		<1		1	
Epistylis niagara				8	1																	
Vorticella sp.							1		<1	<1				<1	<1	1						
Unidentified ciliate		<1	<1	<1								2	1	1	<1							
Rotifera																						
Asplanchna priodonta						<1			<1	<1			<1	<1	<1	<1		<1		<1	1	1
Ascomorpha sp.												<1		<1		<1	<1	<1	1			
Brachionus spp.	<1	<1	<1	1	<1	<1	<1	1	<1	<1	<1	<1	2	3	2	1	1	1	3	2	3	1
Cephalodella sp.																	<1			<1		
Conochiloides spp.	<1	1	<1	<1	<1	2	2	2	5	1	1	1	1	2	1	1		<1	4	3	3	2
Conochilus unicornis	3	2	1	1	1	4	3	9	11	6	4	7	8	8	8	5		6	13	9	16	18
Filinia longiseta									<1			<1	<1		<1	<1	1	<1	3	<1		<1
Gastropus sp.				<1			<1	<1	<1	<1									<1			
Hexarthra mira					<1	<1	1		<1			<1	<1		<1	<1	<1	<1	1	<1	2	2
Kellicottia bostoniensis		<1	<1	<1	<1	<1	<1	1	<1	<1	<1	1	1		<1	1	1	2	5	2		2
Keratella cochlearis	21	15	14	21	16	13	12	15	13	12	12	20	20	21	19	3	4	3	12	4	23	27
Lecane sp.	<1															<1						
Lepadella sp.																	<1	<1		<1		
Notholca sp.				<1	<1		<1	<1				<1				<1	<1			<1		
Polyarthra trigla	1	<1	1	1	1	1	1	1	1	<1	<1	1	1	1	3	2		3	6	2		7
Platyias spp.	<1					<1		<1			<1	<1	<1	<1	<1	<1	<1	1	<1	1		1
Ploesoma spp.	1	<1	<1	<1		<1		<1			<1							<1				
Synchaeta stylata						<1	<1	<1	<1		1	<1	<1	<1	<1	3		16	23	14	6	9
Trichocerca sp.			<1								<1		<1	<1			<1	<1	1	<1		
Ostracoda												<1	<1		<1	<1					<1	
Cladocera																						
Bosmina longirostris	1	1	2	2	1	2	1	1	1	1	1	1	2	2	2	1	<1	1	2	<1	4	4
Ceriodaphnia lacustris		<1		<1	<1	<1	<1	<1	<1	<1			<1	<1	<1		<1	<1			<1	
Diaphanosoma brachyurum	1	<1	<1	1	2	<1	1	1	1	<1		<1	<1	<1	1		<1	<1		<1	1	1
Simocephalus sp.																		<1	<1			
Copepoda																						
Cyclops spp.	<1	1	1	1	1	1	1	1	2	2	2	1	<1	1	1	2	2	3	6	2	2	2
Diaptomus spp.	1	1	1	1	1	2	1	1	1	1	1	<1	1	2	4	<1	<1	<1	<1	<1	7	2
Harpacticoida											<1		<1	<1								
Nauplii and Metanauplii	6	6	4	7	5	5	6	7	7	4	5	8	6	7	5	5	4	4	5	2	8	10
Other Zooplankton		<1		<1							<1		<1			<1		<1		<1	<1	

UNITS = organisms per liter.

APPENDIX N

PONAR MACROINVERTEBRATES

TABLE N-1. Benthic macroinvertebrate taxa collected by Ponar dredge, Middle Black Warrior-Tombigbee Rivers, July 30 - August 4, 1978.

STATION / TAXA	1				2				3				4				5			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Coelenterata																				
Hydra					17			6												
Nematoda																				
Adenophorea									17			6								
Mollusca																				
Gastropoda																				
Campeloma																				
Clappia																				
Goniobasis																				
Pelecypoda																				
Corbicula	17	289	85	130	289	170	255	238	68	85	85	79	34	102	34	57	1580	680	799	1020
Unidentified																				
Oligochaeta																				
Naididae	17	17	17	17			170	57												
Tubificidae	102	221	51	125	119	17	425	187	85	34	102	74	459	51	289	266	85	238	272	198
Unidentified																				
Nemertea																				
Prostoma rubrum							68	23					17			6				
Annelida																				
Hirudinea																				
Bryozoa colonies	17	17	17	17			17	6	17			6								
Crustacea																				
Cladocera																				
Copepoda																				
Cyclopidae							34	11												
Insecta																				
Coleoptera																				
Ordobrevia																				
Ephemeroptera																				
Brachycerus																				
Caenis																				
Hexagenia																	561		17	193
Pentagenia																				
Stenonema																				
Odonata																				
Gomphus lividus																				
Unidentified																				
Trichoptera																				
Cyrnellus							17	6												
Oecetis																				
Unidentified																				
Megaloptera																				
Sialis																				
Chaoboridae																				
Chaoborus		17		6		17	34	17		17		6								
Diptera																				
Ceratopogonidae																	17			6

UNITS = number per m².

TABLE N-1. Continued.

STATION / TAXA	1				2				3				4				5			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid.	Left	Ave/m²	Right	Mid	Left	Ave/m²
Insecta																				
Diptera																				
Chironomidae																				
Ablabesmyia																				
Chironomus																				
Coelotonypus																				
Cricotopus																				
Cryptochironomus					34	17	51	31			136	46		85	51	45	17	17	51	28
Dicrotendipes							17	6												
Glyptotendipes			17	6																
Harnischia																				
Paratendipes															17	6				
Polypedilum		17	17	11											17	6				
Psectrocladius																				
Pseudochironomus																				
Procladius																				
Tanypus																				
Tanytarsus																				
Pentaneura																	102	17		40
Xenochironomus							51	17	204			68	255	17		91				
Unidentified		17		6			17	6	34		51	28		17	34	17		17		6
BIOMASS g/m²	0.0153	0.2483	0.0459	0.10	0.5542	0.4522	1.5827	0.86	1.[illegible]30	0.1938	0.3009	0.57	2.478	0.2278	0.3842	1.03	5.349	0.9622	1.052	2.45
BIOMASS g/m² (clams) *							0.493	0.16		0.3978		0.13							17.970	5.99
SHANNON WEAVER DIVERSITY INDEX				1.992				2.485				2.508				1.926				1.483
EVENNESS				0.958				0.969				1.206				0.990				0.713
TOTAL NUMBER OF ORGANISMS				318				605				312				494				1491

*Biomass, clam meat, only measured when clams exceed 0.5 cm in diameter.

UNITS = number per m².

TABLE N-1. Continued.

STATION / TAXA	6				7				8				9				10			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Coelenterata																				
Hydra																				
Nematoda																				
Adenophorea	17			6			51	17			51	17			17	6			17	8
Mollusca																				
Gastropoda																				
Campeloma																				
Clappia																				
Goniobasis																				
Pelecypoda																				
Corbicula	1156	51	493	567	340	119	1920	793		102	187	96	85		187	91	85		187	136
Unidentified																				
Oligochaeta																				
Naididae																				
Tubificidae		374	2580	985	17	51	289	119	289		85	125	1462	289	170	640	782		1120	957
Unidentified																				
Nemertea																				
Procotyla rubrum	17			6																
Annelida																				
Hirudinea			34	11																
Bryozoa colonies																				
Crustacea																				
Cladocera																				
Copepoda		17		6																
Cyclopidae											51	17								
Insecta																				
Coleoptera																		NOT SAMPLED		
Ordobrevia																				
Ephemeroptera																				
Brachycerus																				
Caenis																				
Hexagenia		51	51	34		170	306	159	102	238	136	159	102	17		40	323		153	238
Pentagenia																				
Stenonema																				
Odonata																				
Gomphus lividus			17	6																
Unidentified																				
Trichoptera																				
Cyrnellus	34			11																
Oecetis			17	6																
Unidentified																				
Megaloptera																				
Sialis									17			6								
Chaoboridae																				
Chaoborus	51	255		102	51	153	323	176	102	119	170	130	17	238	68	109	17		102	60
Diptera																				
Ceratopogonidae							17	6		17	34	17	17		17	11			34	17

UNITS = number per m^2.

TABLE N-1. Continued.

STATION / TAXA	6 Right	6 Mid	6 Left	6 Ave/m²	7 Right	7 Mid	7 Left	7 Ave/m²	8 Right	8 Mid	8 Left	8 Ave/m²	9 Right	9 Mid	9 Left	9 Ave/m²	10 Right	10 Mid	10 Left	10 Ave/m²
Insecta																				
Diptera																				
Chironomidae																				
Ablabesmyia											17	6							17	8
Chironomus									34			11					17			8
Coelotanypus	51	340	289	227		153	153	102	17	272	408	232		102	17	40	51		85	68
Cricotopus																			51	26
Cryptochironomus			51	17	17			6		17	17	11	17		119	45				
Dicrotendipes																				
Glyptotendipes																				
Harnischia																				
Paratendipes																				
Polypedilum																		NOT SAMPLED		
Psectrocladius																				
Pseudochironomus																				
Procladius	102	34	391	176			51	17	17	102	323	147		170		57			85	42
Tanypus			51	17																
Tanytarsus		17	119	45					34	34	34	34					17		17	17
Pentaneura									17	17	34	23	17			6	51			26
Xenochironomus	34			11	731			244	17			6			425	142				
Unidentified		34	170	68	17		17	11			34	11	34		102	45	34		51	42
BIOMASS g/m²	2.244	0.9129	15.870	6.34	10.480	0.7940	2.3700	4.55	12.2500	0.1067	1.2680	4.54	3.5970	0.6103	6.0830	3.43	3.0210		2.6860	1.90
BIOMASS g/m² (clams) *																				
SHANNON WEAVER DIVERSITY INDEX				2.511				2.349				3.228				2.390				2.12
EVENNESS				0.869				0.979				1.164				0.997				0.85
TOTAL NUMBER OF ORGANISMS				2300				1650				1040				1238				999

*Biomass, clam meat, only measured when clams exceed 0.5 cm in diameter.

UNITS = number per m^2.

TABLE N-1. Continued.

TAXA \ STATION	12 Right	12 Mid	12 Left	12 Ave/m²	13 Right	13 Mid	13 Left	13 Ave/m²	14 Right	14 Mid	14 Left	14 Ave/m²	15 Right	15 Mid	15 Left	15 Ave/m²	16 Right	16 Mid	16 Left	16 Ave/m²
Coelenterata																				
Hydra																				
Nematoda																				
Adenophorea	85	51		45																
Mollusca																				
Gastropoda																				
Campeloma																				
Clappia																	17			6
Goniobasis													34			11				
Pelecypoda																				
Corbicula	102	170	17	96	17	34	17	23			17	6	34	17	17	23	17	17		11
Unidentified																			17	6
Oligochaeta																				
Naididae	17			6																
Tubificidae	714	187	442	448	1377	272	612	754	1224	51	153	486	17	119	1343	492	102	187	17	102
Unidentified																				
Nemertea																				
Prostoma rubrum																				
Annelida																				
Hirudinea																				
Bryozoa colonies	17			6																
Crustacea																				
Cladocera	17			6																
Copepoda																				
Cyclopidae			34	11																
Insecta																				
Coleoptera																				
Ordobrevia																				
Ephemeroptera																				
Brachycercus																				
Caenis																				
Hexagenia		68		23	476	102	102	227		68		23		51	289	113	136		17	51
Pentagenia																				
Stenonema																				
Odonata																				
Gomphus lividus																				
Unidentified																				
Trichoptera																				
Cyrnellus													17			6				
Oecetis	17			6																
Unidentified																		17		6
Megaloptera																				
Sialis																				
Chaoboridae																				
Chaoborus	5	85	51	62	102	510	646	419	85	357	51	164	34	119	119	91	34	221	34	96
Diptera																				
Ceratopogonidae	34	68		34	17			6		17		6	17			6				

UNITS = number per m².

TABLE N-1. Continued.

STATION / TAXA	12 Right	12 Mid	12 Left	12 Ave/m²	13 Right	13 Mid	13 Left	13 Ave/m²	14 Right	14 Mid	14 Left	14 Ave/m²	15 Right	15 Mid	15 Left	15 Ave/m²	16 Right	16 Mid	16 Left	16 Ave/m²
Insecta																				
Diptera																				
Chironomidae																				
Ablabesmyia																				
Chironomus																				
Coelotanypus	68	85	17	57	17	85	68	57	17	34		11		17		6	17	85		24
Cricotopus	17			6																
Cryptochironomus																				
Dicrotendipes	51			17																
Glyptotendipes			51	17																
Harnischia	17			6																
Paratendipes		17		6																
Polypedilum							17	6	17	17		11								
Pectrocladius																				
Pseudochironomus	17			6																
Procladius	153	204	153	170			51	17		85	17	34			17	6	17	34		17
Tanypus																				
Tanytarsus	17			6			17	6							17	6				
Pentaneura					10	34	34	26	17	17		11			153	51	34			11
Xenochironomus													17			6		17	578	148
Unidentified	102		34	45																
BIOMASS g/m²	0.1630	0.8670	2.4070	1.15	30.7400	3.7500	8.1550	14.22	10.1400	0.4760	1.0850	3.90	13.470	0.5542	18.62	10.88	1.676	1.870	-	1.18
BIOMASS g/m² (clams)*																				
SHANNON WEAVER DIVERSITY INDEX				3.025				1.948				1.665				1.945				2.603
EVENNESS				0.979				0.846				0.758				0.783				1.085
TOTAL NUMBER OF ORGANISMS				1079				1541				752				817				484

*Biomass, clam meat, only measured when clams exceed 0.5 cm in diameter.

UNITS = number per m².

TABLE N-1. Continued.

TAXA \ STATION	17				18				19				20				21			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Coelenterata																				
Hydra																				
Nematoda																				
Adenophorea																	17			6
Mollusca																				
Gastropoda																				
Campeloma																				
Clappia																				
Goniobasis	85			28																
Pelecypoda																				
Corbicula					17	34	17	23											34	11
Unidentified		17		6			17	6									34		17	17
Oligochaeta																				
Naididae																				
Tubificidae	51			17	136	68	561	255	51		119	56	493	17	102	204	68	17	561	215
Unidentified																				
Nemertea																				
Prostoma rubrum																				
Annelida																				
Hirudinea																	17			6
Bryozoa colonies																				
Crustacea																				
Cladocera																				
Copepoda																				
Cyclopidae																				
Ostracoda																	17			6
Insecta																				
Coleoptera																				
Ordobrevia										17		6								
Ephemeroptera																				
Brachycercus					17			6												
Caenis							68	23												
Hexagenia					357	85	425	289			85	28	238	34	306	193	323		85	136
Pentagenia							119	40												
Stenonema																				
Odonata																				
Gomphus lividus						17		6												
Unidentified						17	17	11												
Trichoptera																				
Cyrnellus																				
Oecetis																				
Unidentified																			17	6
Megaloptera																				
Sialis																				
Chaoboridae																				
Chaoborus	391	374	391	385	391	561	1054	669	2108	1768	6190	3360	850	782	51	561	34	6700	85	22.3
Dolichopodidae					17			6												
Diptera																				
Ceratopogonidae						17	17	11			17	6								

UNITS = number per m^2.

TABLE N-1. Continued.

STATION / TAXA	17				18				19				20				21			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Insecta																				
Diptera																				
Chironomidae																				
Ablabesmyia																				
Chironomus													34			11				
Coelotanypus							85	28	34		68	34								
Cricotopus																				
Cryptochironomus	17			6	17			6												
Dicrotendipes							34	11												
Glyptotendipes																				
Harnischia							17	6												
Paratendipes					51		17	23	17		17	11					17		34	17
Polypedilum					17		34	17												
Paracladius																				
Pseudochironomus																				
Procladius						17	17	11	17		68	28	17	34		17		34		11
Tanypus							17	6	34	17		17								
Tanytarsus			17	6																
Pentaneura					119		272	130	34		34	23					17	17	34	23
Xenochironomus							17													
Unidentified			34	11	68			23	17			6								
BIOMASS g/m²	39.480	0.5712	21.420	20.49	21.430	4.2230	34.850	20.17	1.3430	1.010	9.2040	3.85	13.380	0.7260	6.4900	6.86	28.560	5.900	11.440	15.3
BIOMASS g/m² (clams)*							0.7208	0.24												
SHANNON WEAVER DIVERSITY INDEX				1.002				2.674				0.491				1.569				1.012
EVENNESS				0.515				0.878				0.213				0.975				0.407
TOTAL NUMBER OF ORGANISMS				459				1606				3575				986				2727

*Biomass, clam meat, only measured when clams exceed 0.5 cm in diameter.

UNITS = number per m^2.

TABLE N-1. Continued.

TAXA \ STATION	22				23			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Coelenterata								
Hydra								
Nematoda								
Adenophorea					17			6
Mollusca								
Gastropoda								
Campeloma		68		23	17			6
Clappia								
Goniobasis								
Pelecypoda								
Corbicula	17	255	17	96	136	17		51
Unidentified								
Oligochaeta								
Naididae								
Tubificidae	493	289	238	340	238	340	34	204
Unidentified								
Nemertea								
Prostoma rubrum								
Annelida								
Hirudinea								
Bryozoa colonies								
Crustacea								
Cladocera								
Copepoda								
Cyclopidae								
Insecta								
Coleoptera								
Ordobrevia								
Ephemeroptera								
Brachycerus								
Caenis								
Hexagenia	119	68		62	170		51	74
Pentagenia								
Stenonema								
Unidentified	17			6				
Odonata								
Gomphus lividus								
Unidentified								
Trichoptera								
Cyrnellus								
Oecetis								
Unidentified								
Megaloptera								
Sialis								
Chaoboridae								
Chaoborus	119	340	68	176	68	544	85	232
Diptera								
Ceratopogonidae		34		11				
Heleinae								
Unidentified								

UNITS = number per m^2.

TABLE N-1. Continued.

TAXA \ STATION	22				23			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Insecta								
Diptera								
Chironomidae								
Ablabesmyia								
Chironomus								
Coelotanypus		17	17	11	17	34		11
Cricotopus								
Cryptochironomus	17			6				
Dicrotendipes								
Glyptotendipes								
Harnischia								
Paratendipes		17		6				
Polypedilum			17	6	17			6
Psectrocladius								
Pseudochironomus								
Procladius	17	34		17	51	442		164
Tanypus								
Tanytarsus	34			11	17		17	11
Pentaneura	17			11	85			28
Xenochironomus							17	6
Unidentified	17			6		17		6
BIOMASS g/m²	4.326	107.10	0.5680	37.33	10.230	2.1590	4.1330	5.51
BIOMASS g/m² (clams) *								
SHANNON WEAVER DIVERSITY INDEX				2.527				2.673
EVENNESS				0.911				1.042
TOTAL NUMBER OF ORGANISMS				788				305

*Biomass, clam meat, only measured when clams exceed 0.5 cm in diameter.

UNITS = number per m².

TABLE N-2. Benthic macroinvertebrate taxa collected by Ponar dredge, Middle Black Warrior-Tombigbee Rivers, December 10 - 14, 1978.

STATION / TAXA	1				2				3				4				5			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Coelenterata																				
Hydra																				
Nemertea																				
Prostoma rubrum																				
Nematoda																				
Adenophorea					187	17	17	74	17		34	17								
Secernentea																		17		6
Mollusca																				
Gastropoda																				
Amnicola																				
Gyraulus																				
Laevapex																	17			6
Hydrobiidae																				
Physa																				
Unidentified																				
Pelecypoda																				
Corbicula manilensis	187	204	153	181		68	34	34		119	102	74	17			6	323	816	425	521
Tritigonia verrucosa																	17			6
Unidentified			17	6														17		6
Oligochaeta																				
Naididae	17		68	28																
Tubificidae	799	289	476	521	629	34	340	333	3550	340	3320	2400	1070	1160	1090	1106	2090	238	289	873
Hirudinea	17	17		11													34			11
Crustacea																				
Cladocera																				
Sida crystallina																				
Unidentified	17			6																
Copepoda																				
Diaptomus														17		6				
Cyclopoida																	17	34		17
Ostracoda																				
Amphipoda																				
Crangonyx		34		11																
Unidentified																				
Isopoda																				
Asellus																				
Lirceus	85	17		34																
Unidentified																				
Acarina																				
Unionicola											17	6								
Insecta																				
Ephemeroptera																				
Caenis																				
Hexagenia	65			28					153		51	68	34			11	1160	3040	102	1434
Stenonema	17			6																

UNITS = number per m^2.

TABLE N-2. Continued.

TAXA \ STATION	1				2				3				4				5			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Odonata																				
Gomphus lividus	17			6																
Macromia																				
Unidentified						17		6			34	11								
Megaloptera																				
Sialis																				
Coleoptera																				
Stenelmis																				
Trichoptera																				
Cyrnellus																				
Oecetis																			17	11
Diptera																				
Dolichopodidae																				
Chaoboridae																				
Chaoborus											17	6	17		34	17	34	17	17	23
Ceratopogonidae									34		17	17		17		6	17	17		11
Chironomidae																				
Chironomus											17	6					17			6
Cladotanytarsus																				
Coelotanypus									17		34	17					272	425	85	261
Cricotopus																				
Cryptochironomus	34	34	238	102		17		6	187	17	34	79		34	51	28			85	28
Cryptotendipes																				
Dicrotendipes	34			11													17	85		34
Einfeldia														17		6				
Epoicocladius																				
Glyptotendipes																				
Harnischia																				
Paralendipes																				
Pentaneura																	238	442		227
Polypedilum									17			6			17	6	85			28
Procladius	17			6	17		17	11	136	34	255	142					51	153		68
Psectrocladius																				
Rheotanytarsus																				
Tanytarsus																				
Xenochironomus	34		85	40																
Unidentified																		17	17	11
TOTAL NUMBER OF ORGANISMS				997				465				1748				1200				3830
BIOMASS g/m^2	1.904	0.918	2.329	1.72	1.020	0.663	0.612	0.76	4.947	1.054	3.995	3.38	2.346	0.731	1.785	1.62	16.970	55.370	1.445	24.59
BIOMASS g/m^2 (clams)*																	2.697			0.90
SHANNON-WEAVER DIVERSITY INDEX				2.35				1.32				1.54				0.60				2.63
EVENNESS				0.87				0.74				0.60				0.26				0.89

*Biomass, clam meat, measured only when clams exceed 0.5 cm diameter.

UNITS = number per m^2.

TABLE N-2. Continued.

TAXA \ STATION	6				7				8				9			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Coelenterata																
Hydra																
Nemertea																
Prostoma rubrum			17	6												
Nematoda																
Adenophorea	17	17		11			17	6							17	6
Secernentea																
Mollusca																
Gastropoda																
Amnicola																
Gyraulus						17		6								
Laevirex		17		6												
Hydrobiidae																
Physa																
Unidentified																
Pelecypoda																
Corbicula manilensis	221	578	323	374	952	170	459	527	238	340	544	373	442	136	1840	806
Tritigonia verrucosa																
Unidentified		17	51	23							306	102	53			18
Oligochaeta																
Naididae									34		17	11			17	6
Tubificidae	2330	85	901	1073	374	629	187	397	1670	170	1730	1190	221	918	1090	743
Hirudinea	17		51	23							17	6				
Crustacea																
Cladocera																
Sida crystallina									17			6			17	6
Unidentified																
Copepoda																
Diaptomus																
Cyclopoida	34	17	17	23	34						289	96				
Ostracoda		17		6												
Amphipoda																
Crangonyx																
Unidentified																
Isopoda															17	6
Asellus											17	6				
Lirceus																
Unidentified																
Acarina																
Unionicola	51		68	40					34		238	91	204		34	79
Insecta																
Ephemeroptera																
Caenis													17		17	11
Hexagenia	187	357	425	323	255	119	119	164	17	102	153	91	153	17		56
Stenonema																

UNITS = number per m^2.

TABLE N-2. Continued.

TAXA \ STATION	6				7				8				9			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Odonata																
Gomphus lividus																
Macromia											17	6	17			6
Unidentified																
Megaloptera																
Sialis							17	6								
Coleoptera																
Stenelmis																
Trichoptera																
Cyrnellus																
Oecetis	17			6	17		51	23		34		11				
Diptera																
Dolichopodidae																
Chaoboridae																
Chaoborus	680	544		408	204	187		130		374	595	232	85	51	51	62
Ceratopogonidae	238	102	374	238	51	68	68	62	17	17	17	17	17		17	11
Chironomidae																
Chironomus	34		85	40	34			11	884		17	300	51		34	28
Cladotanytarsus			136	45	34			11								
Coelotanypus	561	493	1100	730	561	527	102	397	51	306	629	328	255		255	170
Cricotopus	17			6												
Cryptochironomus	34	17		17	34	51	17	34	221		17	79		17	34	17
Cryptotendipes	17			6												
Dicrotendipes	17		34	17					102	68		57				
Einfeldia																
Epoicocladius																
Glyptotendipes							17	6		17		6				
Harnischia																
Paratendipes																
Pentaneura	51	221	153	142	136	17	34	62	17	34	51	34	17			6
Polypedilum		17	51	23					34		17	17				
Procladius	323	85	255	221	170	85	187	147	153	51	310	181	204	85	204	164
Psectrocladius																
Rheotanytarsus																
Tanytarsus									238			77				
Xenochironomus																
Unidentified	34		119	51	51			17	34			11				
TOTAL NUMBER OF ORGANISMS				3930				1840				3430				2200
BIOMASS g/m^2	4.933	40.550	21.050	22.18	18.660	3.009	7.803	9.82	18.920	2.295	19.740	13.65	5.678	0.799	4.879	3.79
BIOMASS g/m^2 (clams)*		0.279		0.93	57.42		0.561	19.33					0.558		431.6	144
SHANNON-WEAVER DIVERSITY INDEX				3.26				2.80				3.29				2.48
EVENNESS				1.01				1.01				1.03				0.86

*Biomass, clam meat, measured only when clams exceed 0.5 cm diameter.

UNITS = number per m^2.

TABLE N-2. Continued.

STATION / TAXA	10				12				13				14			
	Right	Mid*	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Coelenterata																
Hydra									119		102	74				
Nemertea																
Prostoma rubrum					17		51	23		51	17	23				
Nematoda																
Adenophorea	17			6	17	17		11								
Secernentea																
Mollusca																
Gastropoda																
Amnicola																
Gyraulus																
Lacvipex											17	6				
Hydrobiidae	17			6												
Physa																
Unidentified																
Pelecypoda																
Corbicula manilensis	153		170	108	612	255	391	419	68	2480	204	917	68	170	17	86
Tritigonia verrucosa																
Unidentified																
Oligochaeta																
Naididae									1160			306			187	62
Tubificidae	714		799	504	1462	357	782	867	748	3430	1850	2010	408	306	748	487
Hirudinea											17	6				
Crustacea																
Cladocera																
Sida crystallina	17			6					17			6	17			6
Unidentified									17			6				
Copepoda																
Diaptomus									17			6				
Cyclopoida	85		17	34	68			23	34	17	119	56	17			6
Ostracoda																
Amphipoda																
Crangonyx																
Unidentified																
Isopoda																
Asellus																
Lirceus																
Unidentified																
Acarina																
Unionicola	17		17	11			34	11	17		17	11	17			6
Insecta																
Ephemeroptera																
Caenis																
Hexagenia	476		340	272	442	102	17	187		102	51	54	34	17		17
Stenonema																

*No sample obtained because of rocky substrate.

UNITS = number per m².

TABLE N-2. Continued.

TAXA \ STATION	10				12				13				14			
	Right	Mid**	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid.	Left	Ave/m²	Right	Mid	Left	Ave/m²
Odonata																
Gomphus lividus																
Macromia																
Unidentified			34	11		17		6								
Megaloptera																
Sialis																
Coleoptera																
Stenelmis																
Trichoptera																
Cyrnellus	34			11												
Oecetis											17	6				
Diptera																
Dolichopodidae																
Chaoboridae																
Chaoborus	170		68	79	289	544	51	295	17	136	238	130	510	357		289
Ceratopogonidae			17	6	34	102	119	75	17		17	11	51	68	17	95
Chironomidae																
Chironomus	34		17	17							17	6				
Cladotanytarsus																
Coelotanypus	221		85	102	187	561	85	278		136		45	255	850	17	374
Cricotopus									17			6				
Cryptochironomus	102		17	40					680	119	153	317	187	34	17	79
Cryptotendipes																
Dicrotendipes	17			6					17			6				
Einfeldia																
Epoicocladius																
Glyptotendipes																
Harnischia							17	6								
Paratendipes																
Pentaneura	34		51	27	51	17		23					51			17
Polypedilum									102	17	255	125		34		11
Procladius	238		68	102	34	51	238	108	236	170	459	289	119	17	17	51
Psectrocladius																
Rheotanytarsus																
Tanytarsus	17		17	11					17			6				
Xenochironomus																
Unidentified					17		34	17		34	17	17				
TOTAL NUMBER OF ORGANISMS				1359				2360				4530				1530
BIOMASS g/m²	6.010		7.140	4.39	22.510	2.414	2.176	3.03	4.522	3.825	2.074	4.36	1.513	5.321	0.935	2.59
BIOMASS g/m² (clams)*																
SHANNON-WEAVER DIVERSITY INDEX				2.96				2.74				2.65				2.69
EVENNESS				1.00				1.01				0.82				1.05

*Biomass, clam meat, measured only when clams exceed 0.5 cm in diameter.

**No sample obtained because of rocky substrate.

UNITS = number per m^2.

TABLE N-2. Continued.

TAXA \ STATION	15				16				17				18			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Coelenterata																
Hydra						17		.6	17	357		125				
Nemertea																
Prostoma rubrum									17			6				
Nematoda																
Adenophorea																
Secernentea																
Mollusca																
Gastropoda																
Amnicola																
Goniobasis cylindracea									17	51		23				
Laevipex																
Hydrobiidae																
Physa																
Unidentified			17	6		51		17								
Pelecypoda																
Corbicula manilensis		85	272	119	51	119	68	62	85	51	85	74	119		34	51
Tritigonia verrucosa																
Unidentified													17			6
Oligochaeta																
Naididae	799			266												
Tubificidae	2680	442	510	1210	1000	578	34	537	85		85	57	51		102	51
Hirudinea																
Crustacea																
Cladocera																
Sida crystallina					51			17								
Unidentified																
Copepoda																
Diaptomus																
Cyclopoida					17	119		45								
Ostracoda																
Amphipoda																
Crangonyx																
Unidentified																
Isopoda																
Asellus																
Lirceus																
Unidentified																
Acarina																
Unionicola					68		17	17	17			6	17			6
Insecta																
Ephemeroptera																
Caenis																
Hexagenia		136	136	91	153	119		91					442		136	193
Stenonema																

UNITS = number per m^2.

TABLE N-2. Continued.

TAXA \ STATION	15 Right	15 Mid	15 Left	15 Ave/m²	16 Right	16 Mid	16 Left	16 Ave/m²	17 Right	17 Mid	17 Left	17 Ave/m²	18 Right	18 Mid	18 Left	18 Ave/m²
Odonata																
Gomphus lividus																
Micromia																
Unidentified																
Megaloptera																
Sialis																
Coleoptera																
Stenelmis										17		6			17	6
Trichoptera																
Cyrnellus																
Oecetis											34	11				
Diptera																
Dolichopodidae	17			6												
Chaoboridae																
Chaoborus		884	136	340	119	1220	34	459	289		17	102	340	102	255	232
Ceratopogonidae	51	51	136	79	51	153	17	79	17			6				
Chironomidae																
Chironomus																
Cladotanytarsus																
Coelotanypus	17	136	425	193	68	544		204	17			6	68	68	17	51
Cricotopus	34			11												
Cryptochironomus	85			28	34	51		28	34	17	17	23				
Cryptotendipes																
Dicrotendipes																
Einfeldia																
Epoicocladius					17			6								
Glyptotendipes																
Harnischia																
Paratendipes																
Pentaneura	17	17	17	17	17	34		17					34			11
Polypedilum						17		6								
Procladius	17	17	68	34	119	136	34	96			17	6	34			11
Psectrocladius						17		6								
Rheotanytarsus							17	6								
Tanytarsus										17		6				
Xenochironomus																
Unidentified					17	17	17	17	34			11				
TOTAL NUMBER OF ORGANISMS				2400				172				465				613
BIOMASS g/m²	2.108	5.644	7.344	5.03	3.145	6.851	0.204	3.40	10.166	0.306	0.153	3.54	5.457	0.255	1.904	2.54
BIOMASS g/m² (clams)*																
SHANNON-WEAVER DIVERSITY INDEX				2.39				2.95				3.01				2.29
EVENNESS				0.93				1.00				1.11				1.04

*Biomass, clam meat, measured only when clams exceed 0.5 cm diameter.

UNITS = number per m^2.

TABLE N-2. Continued.

TAXA \ STATION	19				20				21				22				23			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right*	Mid	Left	Ave/m²
Coelenterata																				
Hydra															51	17				
Nemertea																				
Prostoma rubrum																				
Nematoda																				
Adenophorea																		17		6
Secernentea																				
Mollusca																				
Gastropoda																				
Amnicola									17			6								
Gyraulus																				
Laevapex																				
Hydrobiidae																				
Physa															17	6				
Unidentified																				
Pelecypoda																				
Corbicula manilensis		34	17	17			51	17	17		17	11	17	221	68	102		272	102	125
Tritogonia verrucosa																				
Unidentified									17			6	153	17		56		17		6
Oligochaeta																				
Naididae																			51	17
Tubificidae	527	714	816	686	238	323	323	295	697	102	442	41	136	2400	612	1050		136	272	136
Hirudinea																				
Crustacea																				
Cladocera																				
Sida crystallina																			17	6
Unidentified																				
Copepoda																				
Diaptomus																				
Cyclopoida															170	51				
Ostracoda																				
Amphipoda																				
Crangonyx																				
Unidentified																				
Isopoda																				
Asellus																				
Lirceus																				
Unidentified																				
Acarina																				
Unionicola									238			79.5		17	68	28				
Insecta																				
Ephemeroptera																				
Caenis																				
Hexagenia	51	17	17	28	374		238	204	221		68	96.3	85		153	79		119		40
Stenonema																				

* No sample obtained due to rocky substrate.

UNITS = number per m².

TABLE N-2. Continued.

STATION / TAXA	19 Right	19 Mid	19 Left	19 Ave/m²	20 Right	20 Mid	20 Left	20 Ave/m²	21 Right	21 Mid	21 Left	21 Ave/m²	22 Right	22 Mid	22 Left	22 Ave/m²	23 Right**	23 Mid	23 Left	23 Ave/m²
Odonata																				
Gomphus lividus															17	6				
Macromia																				
Unidentified																				
Megaloptera																				
Sialis																				
Coleoptera																				
Stenelmis									68			23								
Trichoptera																				
Cyrnellus																			17	6
Oecetis							17	6		17		6			17	6				
Diptera																				
Dolichopodidae																				
Chaoboridae																				
Chaoborus	527	119	340	329	238	459		232	68	1070	340	498	272	1241		504		2060	323	794
Ceratopogonidae			17	6	34		34	23	85	17	34	45			34	11		34		11
Chironomidae																				
Chironomus		238	17	85	34	459	119	204	697	561	17	405	102	34	51	68				
Cladotanytarsus																		17	17	11
Coelotanypus			17	6	68		119	40	51	119	187	187	204	136	85	142		85		28
Cricotopus																				
Cryptochironomus			68	23		68	102	56	102	153	51	100			136	45		17		6
Cryptotendipes																				
Dicrotendipes																				
Einfeldia																				
Epoicocladius											17	6								
Glyptotendipes									425			142			17	6				
Harnischia																				
Paratendipes															170	56				
Pentaneura	17	17		11	204		51	17	170		68	79	17	17	34	33		51		17
Polypedilum			17	6			17	6							85	28				
Procladius	68	51	34	51	119	34	187	79	374			125	34	153	340	62		102	204	102
Psectrocladius															17	6				
Rheotanytarsus																				
Tanytarsus																				
Xenochironomus																				
Unidentified						17	17	11												
TOTAL NUMBER OF ORGANISMS				1247				100				217				2350				1300
BIOMASS g/m²	0.646	2.686	6.698	3.34	27.680	1.870	3.332	10.96	1.279	5.610	9.435	5.49	6.562	1.870	8.415	5.62		4.318	0.102	1.47
BIOMASS g/m² (clams)*																				
SHANNON-WEAVER DIVERSITY INDEX				1.92				2.93				3.19				2.78				2.07
EVENNESS				0.80				1.14				1.13				0.91				0.76

* Biomass, clam meat, measured only when clams exceed 0.5 cm diameter.
** No sample obtained because of rocky substrate.

UNITS = number per m².

TABLE N-3. Benthic Macroinvertebrates collected by Ponar dredge, Middle Black Warrior-Tombigbee Rivers, May 13-16, 1979.

STATION	1				2				3				4				5			
TAXA	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²
Nematoda																				
Adenophorea									19			6						19		6
Unidentified																				
Mollusca																				
Gastropoda																				
Gyraulus																				
Pelecypoda																				
Corbicula manilensis																		56		19
Obliquaria reflexa																				
Oligochaeta																				
Naididae																				
Tubificidae	205	56	19	93		19	223	81					37		149	62	1300	167	93	520
Crustacea																				
Cladocera																				
Ceriodaphnia																				
Daphnia			37	12																
Holopedium amazonicum		19	37	19					19			6						19		6
Sida crystallina																				
Copepoda																				
Cyclopoida						19		6	19			6						19		6
Amphipoda																				
Hyalella azteca																				
Isopoda																				
Asellus															19	6				
Acarina																				
Unionicola																				
Insecta																				
Ephemeroptera																				
Hexagenia																				
Unidentified																				
Odonata																				
Dromogomphus																				
Plecoptera																				
Neoperla clymene																				
Coleoptera																				
Stenelmis																				
Dubiraphia[illegible]																				
Unidentified																				
Trichoptera																				
Hydropsyche																				
Diptera																				
Chaoboridae																				
Chaoborus										19	112	44	37		19	19		37		12
Ceratopogonidae						19		6									19			6
Simuliidae																				
Simulium																				

UNITS = number per m².

TABLE N-3. Continued.

TAXA \ STATION	1				2				3				4				5			
	Right	Mid	Left	Avg/m²	Right*	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²
Chironomidae																				
Chironomus			19	6																
Cladotanytarsus														19		6				
Coelotanypus																				
Cryptochironomus																		19		6
Paracladopelma																				
Paratendipes																				
Pentaneura																				
Polypedilum	19			6																
Procladius																		37		12
Stictochironomus																				
Tanytarsus																				
Unidentified	37			12					19			6						19		6
TOTAL NUMBER OF ORGANISMS				149				93				69				280				600
BIOMASS g/m²	0.26	0.02	0.09	0.12	0	0.07	0.32	0.12	0.04	0.02	0.13	0.06	0.06	0.02	0.24	0.11	3.01	0.59	0.33	1.31
BIOMASS g/m² (clams)**																		50.16		16.72
SHANNON-WEAVER DIVERSITY INDEX				1.78				0.71				1.68				1.38				0.98
EVENNESS				0.99				0.65				1.04				1.00				0.42

* No organisms collected.

** Biomass clam meat, measured only when clams exceed 0.5 cm in diameter.

UNITS = number per m^2.

TABLE N-3. Continued.

STATION	6				7				8				9				10			
TAXA	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²
Nematoda																				
Adenophorea			19	6						19		6	37			12				
Unidentified																				
Mollusca																				
Gastropoda																				
Gyraulus																				
Pelecypoda																				
Corbicula manilensis	19	74		31		37		12		316	19	112	56			19				
Obliquaria reflexa																				
Oligochaeta																				
Naididae																				
Tubificidae	56	19	539	205	298			99	112	986	242	447	335	316	595	417	37	19	37	31
Crustacea																				
Cladocera																				
Ceriodaphnia																				
Daphnia																				
Holopedium amazonicum																				
Sida crystallina																				
Copepoda																				
Cyclopoida																			19	6
Amphipoda																				
Hyalella azteca																				
Isopoda																				
Asellus																				
Acarina																				
Unionicola		19		6																
Insecta																				
Ephemeroptera																				
Hexagenia									19		186	68	19			6				
Unidentified																				
Odonata																				
Dromogomphus													19			6				
Plecoptera																				
Neoperla clymene																				
Coleoptera																				
Stenelmis																				
Uvarus																				
Unidentified																				
Trichoptera																				
Hydropsyche																				
Diptera																				
Chaoboridae																				
Chaoborus			19	6			37	12		223	19	81		56	74	43				
Ceratopogonidae		37		12							19	6	19		19	13				
Simuliidae																				
Simulium																				

UNITS = number per m^2.

TABLE N-3. Continued.

TAXA \ STATION	6 Right	6 Mid	6 Left	6 Avg/m²	7 Right	7 Mid	7 Left	7 Avg/m²	8 Right	8 Mid	8 Left	8 Avg/m²	9 Right	9 Mid	9 Left	9 Avg/m²	10 Right	10 Mid	10 Left	10 Avg/m²
Chironomidae																				
Chironomus					19			6												
Cladotanytarsus																				
Coelotanypus							19	6	56	74	112	81	19		19	13				
Cryptochironomus	19			5						19		6		19		6				
Paracladopelma										93	19	37	19			6				
Paratendipes							19	6			19	6			19	6				
Pentaneura																				
Polypedilum										18	37	18								
Procladius					19		56	25	37	37	37	37	186	19	37	81				
Stictochironomus																				
Tanytarsus																				
Unidentified										19		6								
TOTAL NUMBER OF ORGANISMS				248				162				913				630				37
BIOMASS g/m²	0.54	0.09	2.10	0.91	0.71	0.02	0.11	0.28	0.99	6.57	10.23	5.93	4.84	0.71	1.00	2.18	0.02	0.02	0.06	0.03
BIOMASS g/m² (clams)**										219.5		73.17								
SHANNON-WEAVER DIVERSITY INDEX				1.12				1.78				2.51				1.86				0.66
EVENNESS				0.57				0.99				0.98				0.75				0.95

** Biomass clam meat, measured only when clams exceed 0.5 cm in diameter.

UNITS = number per m².

TABLE N-3. Continued.

TAXA \ STATION	12				13				14				15				16			
	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²	Right	Mid	Left	Avg/m²
Nematoda																				
Auenophorea																				
Unidentified																				
Mollusca																				
Gastropoda																				
Gyraulus																				
Pelecypoda																				
Corbicula manilensis						37		12		19	37	19					37	112	37	62
Obliquaria reflexa																				
Oligochaeta																				
Naididae																				
Tubificidae	19	19	19	19	205	19	167	130			1,400	467	130			43	409	353	242	335
Crustacea																				
Cladocera																				
Ceriodaphnia																				
Daphnia																				
Holopedium amazonicum																				
Sida crystallina									19			6							37	12
Copepoda																				
Cyclopoida						19		6			19	6			19	6				
Amphipoda																				
Hyalella azteca					19			6												
Isopoda																				
Asellus																				
Acarina																				
Unionicola	19			6																
Insecta																				
Ephemeroptera																				
Hexagenia																				
Unidentified																				
Odonata																				
Dromogomphus					19			6												
Plecoptera																				
Neoperla clymene																				
Coleoptera																				
Stenelmis																				
Uvarus																		19		6
Unidentified																				
Trichoptera																				
Hydropsyche																				
Diptera																				
Chaoboridae																				
Chaoborus			19	6	37		19	19		37		12	19		37	19			19	6
Ceratopogonidae											19	6								
Simuliidae																				
Simulium																				

UNITS = number per m^2.

TABLE N-3. Continued.

STATION / TAXA	12 Right	12 Mid	12 Left	12 Avg/m²	13 Right	13 Mid	13 Left	13 Avg/m²	14 Right	14 Mid	14 Left	14 Avg/m²	15 Right	15 Mid	15 Left	15 Avg/m²	16 Right	16 Mid	16 Left	16 Avr/m²
Chironomidae																				
Chironomus																				
Cladotanytarsus																				
Coelotanypus					37		19	19			93	31					19			6
Cryptochironomus						19	19	13												
Paracladopelma										19		6					19			6
Paratendipes						56	56	37												
Pentaneura																				
Polypedilum																				
Procladius					19			6			19	6					74			25
Stictochironomus																				
Tanytarsus																				
Unidentified	19			6		56		19										19		6
TOTAL NUMBER OF ORGANISMS				38				274				560				68				477
BIOMASS g/m²	0.02	0.11	0.07	0.07	1.12	0.43	0.56	0.70	0.02	0.07	3.35	1.15	0.37	0.02	0.02	0.14	4.80	0.87	5.36	3.67
BIOMASS g/m² (clams)**																				
SHANNON-WEAVER DIVERSITY INDEX				1.37				[illegible]				1.10				1.25				1.77
EVENNESS				1.25				1.05				0.50				1.13				0.85

* No organisms collected.

** Biomass clam meat, measured only when clams exceed 0.5 cm in diameter.

UNITS = number per m2.

TABLE N-3. Continued.

TAXA \ STATION	17				18				19				20				21			
	Right$^{\Delta}$	Mid	Left$^{\Delta}$	Avg/m^2	Right	Mid$^{\Delta}$	Left	Avg/m^2	Right	Mid	Left	Avg/m^2	Right	Mid$^{\Delta}$	Left	Avg/m^2	Right	Mid$^{\Delta}$	Left	Avg/m^2
Nematoda																				
Aderophorea		19		6																
Unidentified																				
Mollusca																				
Gastropoda																				
Gyraulus																				
Pelecypoda																				
Corbicula manilensis										19		6							19	6
Obliquaria reflexa							19	6												
Oligochaeta																				
Naididae									19			6								
Tubificidae					19		260	93	19		19	13	484		19	167	112		37	50
Crustacea																				
Cladocera																				
Ceriodaphnia									19			6								
Daphnia																				
Holopedium amazonicum																				
Sida crystallina					19			6	19			6			19	6				
Copepoda																				
Cyclopoida																				
Amphipoda																				
Hyalella azteca											19	6								
Isopoda																				
Asellus																				
Acarina																				
Unionicola																				
Insecta																				
Ephemeroptera																				
Hexagenia																				
Unidentified											19	6								
Odonata																				
Dromogomphus																				
Plecoptera																				
Hesperla clymene					19			6												
Coleoptera																				
Stenelmis									19			6								
Dubiraphia																				
Unidentified											19	6								
Trichoptera																				
Hydropsyche																			19	6
Diptera																				
Chaoboridae																				
Chaoborus									19			6			37	12	37			12
Ceratopogonidae																				
Simuliidae																				
Simulium									19			6								

UNITS = number per m2.

TABLE N-3. Continued.

STATION / TAXA	17				18				19				20				21			
	Right[Δ]	Mid	Left[Δ]	Avg/m²	Right	Mid[Δ]	Left	Avg/m²	Right	Mid	Left	Avg/m²	Right	Mid[Δ]	Left	Avg/m²	Right	Mid[Δ]	Left	Avg/m²
Chironomidae																				
Chironomus							93	31	93			31			19	6				
Cladotanytarsus																				
Coelotanypus																				
Cryptochironomus															19	6			19	6
Paracladopelma															19	6				
Paratendipes							37	12											37	12
Pentaneura																				
Polypedilum					37			12									19			6
Procladius									19			6			19	6				
Stictochironomus																				
Tanytarsus									19			6								
Unidentified									19		19	13								
TOTAL NUMBER OF ORGANISMS				6				167				126				205				100
BIOMASS g/m²	0	0.02	0	0.01	0.91	0	2.51	1.14	0.28	0.19	0.45	0.31	0.60	0	0.07	0.22	0.22	0	0.13	0.12
BIOMASS g/m² (clams)[♦]							101.2[†]	101.2[†]												
SHANNON-WEAVER DIVERSITY INDEX				0[T]				2.01				3.65				1.10				2.26
EVENNESS				0[T]				1.03				1.35				0.61				1.16

[♦] Biomass clam meat, measured only when clams exceed 0.5 cm in diameter.

[Δ] No organisms collected.

[†] *Obliquaria reflexa*

[T] Diversity index and evenness cannot be computed with only one taxa.

UNITS = number per m2.

TABLE N-3. Continued.

TAXA \ STATION	22 Right	22 Mid	22 Left	22 Avg/m²	23 Right	23 Mid	23 Left	23 Avg/m²
Nematoda								
Adenophorea					19			6
Unidentified								
Mollusca								
Gastropoda								
Gyraulus					19			6
Pelecypoda								
Corbicula manilensis	37	74		37	19			6
Obliquaria reflexa								
Oligochaeta								
Naididae								
Tubificidae	19		116	45	167	37	744	316
Crustacea								
Cladocera								
Ceriodaphnia								
Daphnia								
Holopedium amazonicum								
Sida crystallina			19	6				
Copepoda								
Cyclopoida	130			43				
Amphipoda								
Hyalella azteca							19	6
Isopoda								
Asellus								
Acarina								
Unionicola								
Insecta								
Ephemeroptera								
Hexagenia	632			211				
Unidentified								
Odonata								
Dromogomphus								
Plecoptera								
Neoperla clymene								
Coleoptera								
Stenelmis								
Uvarus								
Unidentified								
Trichoptera								
Hydropsyche								
Diptera								
Chaoboridae								
Chaoborus	37	19	19	25	19	19		13
Ceratopogonidae								
Simuliidae								
Simulium			19	6				

UNITS = number per m^2.

TABLE N-3. Continued.

TAXA \ STATION	22 Right	22 Mid	22 Left	22 Avg/m²	23 Right	23 Mid	23 Left	23 Avg/m²
Chironomidae								
Chironomus								
Cladotanytarsus								
Coelotanypus	298		19	106			19	6
Cryptochironomus							19	6
Paracladopelma	19			6	37			12
Paratendipes								
Pentaneura	112			37	19			6
Polypedilum					19			6
Procladius	112			37	37	19		19
Stictochironomus								
Tanytarsus								
Unidentified	19			6				
TOTAL NUMBER OF ORGANISMS				560				410
BIOMASS g/m²	76.7	2.60	2.14	27.14	1.80	0.09	1.77	1.22
BIOMASS g/m² (clams)**								
SHANNON-WEAVER DIVERSITY INDEX				2.76				1.54
EVENNESS				1.15				0.62

** Biomass clam meat, measured only when clams exceed 0.5 cm in diameter.

UNITS = number per m2.

TABLE N-4. Benthic macroinvertebrate taxa collected by Ponar dredge, Middle Black Warrior-Tombigbee Rivers, June 17 - 20, 1979.

	1				2				3				4				5			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Porifera										19		6								
Coelenterata																				
Hydra									186			62								
Nematoda																				
Adenophorea						19		6											19	6
Unidentified																				
Bryozoa (colonies)										19		6								
Mollusca																				
Gastropoda																				
Birgella subglobosa																				
Gyraulus																				
Laevapex																				
Pleurocera																				
[illegible]																				
Unidentified					19			6												
Pelecypoda																				
Corbicula manilensis	74		37	37	19	68		29									502	298	205	335
Tritigonia verrucosa																				
Unidentified																				
Oligiochaeta																				
Naididae																				
Tubificidae		19	112	44		37	484	174					19	56	37	37	149	56	483	229
Hirudinae																				
Crustaceae																				
Cladocera																				
Ceriodaphnia																				
Daphnia										19		6								
Holopedium amazonicum																				
Ilyocryptus spinifer																				
Sida crystallina																				
Unidentified																				
Copepoda																				
Diaptomus																				
Cyclopoida																				
Amphipoda																				
Hyalella azteca																				
Isopoda																				
Asellus																				
Lirceus			19	6																
Acarina																				
Unionicola																				
Insecta																				
Ephemeroptera																				
Caenis																				
Hexagenia																				
Stenonema																				
Tortopus																				
Tricorythodes																				

UNITS = number per m2.

TABLE N-4. Continued.

	1				2				3				6				5			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Ephemeroptera																				
Unidentified																				
Odonata																				
Gomphus																				
Unidentified																				
Megaloptera																				
Sialis																				
Coleoptera																				
Berosus																				
Stenelmis																				
Trichoptera																				
Cheumatopsyche																				
Cyrnellus										19		6						19		6
Hydropsyche																				
Oecetis																				
Potamyia																				
Unidentified																				
Diptera																				
Empididae																	19			6
Chaoboridae																				
Chaoborus																				
Ceratopogonidae																	37			12
Chironomidae																				
Ablabesmyia										37		12						19		6
Chironomus																				
Cladotanytarsus																				
[illegible]																				
Cricotopus																			19	6
Cryptochironomus						19		6									19			6
Cryptotendipes																				
Dicrotendipes																			19	6
Epoicocladius																				
Glyptotendipes																				
Harnischia											37	12								
[illegible]																				
Micropsectra																				
Orthocladius																			37	12
Parachironomus					19			6	19			6		19		6				
Paratendipes																	19			6
Pentaneura																				
Phaenopsectra																				
Polypedilum			19	6			242	81			19	6					260	19	37	105
Procladius																			19	6
Psectrocladius									19			6								
Rheotanytarsus										19		6								
Stenochironomus																				
Stictochironomus			37	12													74			25

UNITS = number per m2.

TABLE N-4. Continued.

	1				2				3				4				5			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Chironomidae																				
Tanytarsus																			37	12
[illegible]chironomus					56			19					19		56	25				
Unidentified									19			6					56			19
TOTAL NUMBER OF ORGANISMS				106				327				134				68				785
BIOMASS gm/m^2	0.06	0.02	0.26	0.11	0.04	0.09	0.63	0.25	0.06	0.09	0.02	0.06	0.04	0.02	0.28	0.11	0.58	0.22	0.63	0.48
BIOMASS gm/m^2 (clams)*																		59.5		19.8
SHANNON-WEAVER DIVERSITY INDEX				1.73				1.95				2.74				1.32				2.47
EVENNESS				1.25				0.94				1.14				1.20				0.87

* No organisms collected

** Biomass, clam meat, measured only when clams exceeded 0.5 cm length

UNITS = number per m^2.

TABLE N-4. Continued.

	6				7				8				9				10			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Porifera																				
Coelenterata																				
Hydra																	19			6
Nematoda																				
Adenophorea					19	19	56	31	19			6			19	6			19	6
Unidentified															19	6	19			6
Bryozoa (colonies)						19		6							19	6	19			6
Mollusca																				
Gastropoda																				
Birgella subglobosa																				
Gyraulus															19	6				
Laevipex						19		6												
Pleurocera																				
Parulopsis																	19			6
Unidentified																				
Pelecypoda																				
Corbicula manilensis	502	130	502	378	112	223	19	118		37	56	31	74	93	372	179	744	632	149	509
Tritigonia verrucosa																				
Unidentified			223	68											37	12	74			25
Oligiochaeta																				
Naididae			19	6											19	6	56		19	25
Tubificidae	464	465	10300	3730	2710	74	19	935	985	93	37	372	2120	130	3050	1770	1730	149	372	749
Hirudinae																				
Crustaceae																				
Cladocera																				
Ceriodaphnia									19			6			19	6				
Daphnia						19		6												
Bolepedium amazonicum						56		19							19	6				
Ilyocryptus spinifer					19			6							19	6	19			6
Sida crystallina	19	19	74	37		19	37	19					19		56	25				
Unidentified																				
Copepoda																				
Diaptomus																				
Cyclopoida									19			6		37	53	30	19		19	12
Amphipoda																				
Hyalella azteca							19	6												
Isopoda																				
Asellus			19	6																
Lirceus																				
Acarina																				
Unionicola																	37	19		19
Insecta																				
Ephemeroptera																				
Caenis																				
Hexagenia									93	19		37	56			19	19			6
Stenonema																				
Tortopus																				
Tricorythodes																				

UNITS = number per m^2.

TABLE N-4. Continued.

	6				7				8				9				10			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Ephemeroptera																				
Unidentified																				
Odonata																				
Gomphus																				
Unidentified																				
Megaloptera																				
Sialis																	37		37	25
Coleoptera																				
Berosus							19	6												
Stenelmis																	19			6
Trichoptera																				
Cheumatopsyche																				
Cyrnellus																	19	19		13
Hydropsyche																				
Oecetis							19	6							19	6	19		19	13
Potamyia																				
Unidentified																				
Diptera																				
Empididae																				
Chaoboridae																				
Chaoborus	19	93		37		93		31	37	74	353	155	74	223	409	235	37	56	112	68
Ceratopogonidae			19	6	37		19	19	37			12	56	19	112	62	74			25
Chironomidae																				
Ablabesmyia																	37			12
Chironomus			37	12					37		19	19								
Cladotanytarsus					37			12							56	19				
Coelotanypus	37	56	19	37					130	74		68	19	19		13				
Cricotopus																				
Cryptochironomus			130	43	56			19			19	6		37	56	31	74			25
Cryptotendipes																				
Dicrotendipes																				
Epoicocladius																				
Glyptotendipes															298	99				
Harnischia		74	130	68	112			37	19			6					56	19		25
Labrundinia																				
Micropsectra																				
Orthocladius			130	43																
Parachironomus																				
Paratendipes																			19	6
Pentaneura									74	19		31	74			25				
Phaenopsectra														19		6				
Polypedilum					37		19	19			19	6			186	62	56	19	19	31
Procladius	93	19	186	99	56	37		31	130	19	149	99	37	37	37	37	37		37	25
Psectrocladius																				
Rheotanytarsus																				
Stenochironomus						19		6												
Stictochironomus																			19	6

UNITS = number per m².

TABLE N-4. Continued.

	6				7				8				9				10			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Chironomidae																				
Tanytarsus			1400	466	465		19	161	74		19	31	37		298	112	37	19		19
Xenochironomus																				
Unidentified		19		6					34		19	19	37		56	31	136	19	19	58
TOTAL NUMBER OF ORGANISMS				5042				530				910				2803				1732
BIOMASS gm/m^2	0.93	0.78	11.61	4.44	14.23	0.39	0.29	4.97	9.88	0.54	0.54	3.65	8.33	0.39	6.71	5.14	5.08	1.36	0.78	2.41
BIOMASS gm/m^2 (clams)*		59.3		19.8																
SHANNON-WEAVER DIVERSITY INDEX				1.54				2.31				2.87				2.31				2.71
EVENNESS				0.55				0.76				1.02				0.70				0.82

* No organisms collected

** Biomass, clam meat, measured only when clams exceeded 0.5 cm length

UNITS = number per m^2.

TABLE N-4. Continued.

	12				13				14				15				16			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Porifera																				
Coelenterata																				
Hydra																				
Nematoda																				
Adenophorea	19	19	19	19	19	19		12	19	19	112	50	37			12			19	6
Unidentified																			19	6
Bryozoa (colonies)							19	6												
Mollusca																				
Gastropoda																				
Birgella subglobosa																				
Gyraulus																				
Laevapex																				
Pleurocera																				
Cincinnatia																				
Unidentified																				
Pelecypoda																				
Corbicula manilensis	72	446	93	204		354	19	124		112	56	56	37	19		19	19		130	50
Tritigonia verrucosa													19			6				
Unidentified	19			6							19	6								
Oligochaeta																				
Naididae	19			6					520			173								
Tubificidae		93	1400	498	19	37	186	81	1120	539	1650	1103	3500	130	465	1360	298	112	1280	563
Hirudinae									19			6								
Crustaceae																				
Cladocera																				
Ceriodaphnia													19		19	12				
Daphnia																				
Holopedium amazonicum														19		6				
Ilyocryptus spinifer																				
Sida crystallina			19	6	37			12	19		37	19					19			6
Unidentified										19		6	19			6				
Copepoda																				
Diaptomus			56	19																
Cyclopoida		19		6					37			12			19	6				
Amphipoda																				
Hyalella azteca					19			6												
Isopoda																				
Asellus																				
Lirceus																				
Acarina																				
Unionicola																				
Insecta																				
Ephemeroptera																				
Caenis																				
Hexagenia	19			6									19		19	12		19		6
Stenonema																				
Tortopus																				
Tricorythodes																				

UNITS = number per m^2.

TABLE N-4. Continued.

TAXA \ STATION	12				13				14				15				16			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Ephemeroptera																				
Unidentified																				
Odonata																				
Gomphus																				
Unidentified		19		6							19	6								
Megaloptera																				
Sialis	19			6																
Coleoptera																				
Berosus																				
Stenelmis																				
Trichoptera																				
Cheumatopsyche																				
Cyrnellus										37		12								
Hydropsyche										19		6								
Oecetis											37	12	37			12				
Potamyia												12								
Unidentified										37		12								
Diptera																				
Empididae																				
Chaoboridae																				
Chaoborus	19	37	19	25	19	149		56		242		81		149	19	56	205	335	19	186
Ceratopogonidae			56	19					149			50	112			37	19			6
Chironomidae																				
Ablabesmyia									37		74	37	223			74				
Chironomus									74			25	56			19				
Cladotanytarsus																				
Coelotanypus										19	19	12	37			12		37		12
Cricotopus							19	6												
Cryptochironomus		19	19	12					241	37	37	105	37	19		19	37			12
Cryptotendipes						19		6	37			12	37			12				
Dicrotendipes			19	6			19	6					37			12				
Epoicocladius																				
Glyptotendipes																				
Harnischia		56		19						37	19	19			19	6				
Labrundinia																				
Micropsectra									37			12								
Orthocladius																				
Parachironomus																				
Paratendipes		19		6						19		6								
Pentaneura											19	6								
Phaenopsectra																				
Polypedium			112	37			19	6	550	93	37	229		19	19	12				
Procladius	37			12		19		6	74	37	19	43	205	186	167	57		56		19
Psectrocladius																				
Rheotanytarsus																				
Stenochironomus											19	6								
Stictochironomus																				

UNITS = number per m^2.

TABLE N-4. Continued.

	12				13				14				15				16			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Chironomidae																				
Tanytarsus									74	19	33	42	279	19		99				
Xenochironomus	279			93	19			6							74	25	37			12
Unidentified	19		19	12	19			6	205	19		75	19			6				
TOTAL NUMBER OF ORGANISMS				1023				339				2245				1887				884
BIOMASS gm/m^2	1.13	0.35	2.45	1.31	0.09	0.20	0.20	0.16	2.04	1.08	1.06	1.39	285	0.56	0.52	95.4	0.71	0.61	1.84	1.05
BIOMASS gm/m^2 (clams)*																				
SHANNON-WEAVER DIVERSITY INDEX				2.65				2.72				3.04				1.87				1.74
EVENNESS				0.87				1.05				0.88				0.59				0.70

* No organisms collected

** Biomass, clam meat, measured only when clams exceeded 0.5 cm length

UNITS = number per m^2.

TABLE N-4. Continued.

	17				18				19				20				21			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Ephemeroptera																				
Unidentified									37			12								
Odonata																				
Gomphus													19			6				
Unidentified															19	6				
Megaloptera																				
Sialis																				
Coleoptera																				
Berosus																				
Stenelmis																				
Trichoptera																				
Cheumatopsyche																				
Cyrnellus															112	37				
Hydropsyche						19		6												
Oecetis																				
Potamyia	130			43			19	6												
Unidentified	93			31		19		6												
Diptera																				
Empididae																				
Chaoboridae																				
Chaoborus							74	25			74	25	260	19		93			167	56
Ceratopogonidae	19			6										19		6	19		19	38
Chironomidae																				
Ablabesmyia	74			25		19		6												
Chironomus																			37	12
Cladotanytarsus																				
Coelotanypus															37	12				
Cricotopus																				
Cryptochironomus					19	19		13			37	12	19			6	19			6
Cryptotendipes					19			6												
Dicrotendipes																				
Epoicocladius						19		6												
Glyptotendipes																				
Harnischia																				
Larsia																			19	6
Micropsectra																				
Orthocladius																				
Parachironomus		19		6	19			6												
Paratendipes											19	6								
Pentaneura											19	6							56	19
Phaenopsectra																				
Polypedilum	74			25	260	56	19	112					19		19	12	19			6
Procladius						37		12					19	37	93	49	19			6
Psectrocladius																				
Rheotanytarsus																				
Stenochironomus															19	6	19			6
Stictochironomus					19			6												

UNITS = number per m^2.

TABLE N-4. Continued.

	17				18				19				20				21			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Porifera																				
Coelenterata																				
Hydra																				
Nematoda																				
Adenophorea																				
Unidentified																				
Bryozoa (colonies)																				
Mollusca																				
Gastropoda																				
Birgella subglobosa																				
Gyraulus																				
Laevapex																				
Pleurocera																	19			6
[illegible]																				
Unidentified																				
Pelecypoda																				
Corbicula manilensis					167			56	93	37		43			37	12	19			6
Tritogonia verrucosa																				
Unidentified																				
Oligiochaeta																				
Naididae					19			6							19	6				
Tubificidae			93	31	298	37	334	223	130		56	62	37		56	31	856		335	397
Hirudinae																				
Crustaceae																				
Cladocera																				
Ceriodaphnia																				
Daphnia																				
Holopedium amazonicum																				
Ilyocryptus spinifer																				
Sida crystallina															37	12				
Unidentified																				
Copepoda																				
Diaptomus																				
Cyclopoida																				
Amphipoda																				
Hyalella azteca																				
Isopoda																				
Asellus																				
Lirceus																				
Acarina																				
Unionicola																				
Insecta																				
Ephemeroptera																				
Caenis	19			6		37	19	19	19	19	39	26			112	37				
Hexagenia											19	6	19			6			130	43
Stenonema	19			6							19	6								
Tortopus									19			6								
Tricorythodes										19		6								

UNITS = number per m^2.

TABLE N-4. Continued.

	17				18				19				20				21			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid*	Left	Ave/m^2
Chironomidae																				
Tanytarsus																				
Xenochironomus									19			6								
Unidentified		19		6		37		12		19	19	13							56	19
TOTAL NUMBER OF ORGANISMS				154				516				241				331				600
BIOMASS gm/m^2	0.86	0.04	1.04	0.65	0.89	0.13	1.02	0.68	0.95	0.04	0.32	0.44	2.45	0.04	0.69	1.37	2.64	0	13.8	5.48
BIOMASS gm/m^2 (clams)*																				
SHANNON-WEAVER DIVERSITY INDEX				2.98				2.79				3.35				3.31				2.08
EVENNESS				1.29				0.99				1.24				1.19				0.75

* No organisms collected

** Biomass, clam meat, measured only when clams exceeded 0.5 cm length

UNITS = number per m^2.

TABLE N-4. Continued.

	22				23			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Porifera								
Coelenterata								
Hydra			19	6				
Nematoda								
Adenophorea	19			6				
Unidentified								
Bryozoa (colonies)								
Mollusca								
Gastropoda								
Birgella subglobosa	56			19				
Gyraulus								
Lioplax								
Pleurocera								
Pyrgulopsis								
Unidentified					19			6
Pelecypoda								
Corbicula manilensis		502	93	198		93	37	43
Tritigonia verrucosa								
Unidentified	316	19		112	19			6
Oligiochaeta								
Naididae								
Tubificidae	595	186	74	236	1340	37	74	482
Hirudinae		19		6				
Crustaceae								
Cladocera								
Ceriodaphnia								
Daphnia								
Holopedium amazonicum								
Ilyocryptus spinifer								
Sida crystallina	19			6				
Unidentified								
Copepoda								
Diaptomus								
Cyclopoida		19		6				
Amphipoda								
Hyalella azteca								
Isopoda								
Asellus								
Lirceus								
Acarina								
Unionicola								
Insecta								
Ephemeroptera								
Caenis								
Hexagenia	409	19	37	155		19		6
Stenonema								
Tortopus			19	6				
Tricorythodes								

UNITS = number per m^2.

TABLE N-4. Continued.

	22				23			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Ephemeroptera								
Unidentified							19	6
Odonata								
Gomphus								
Unidentified		19		6				
Megaloptera								
Sialis								
Coleoptera								
Berosus								
Stenelmis								
Trichoptera								
Cheumatopsyche			56	19				
Cyrnellus			56	19		19		6
Hydropsyche								
Oecetis		74	19	30				
Potamyia		19		6				
Unidentified								
Diptera								
Empididae								
Chaoboridae								
Chaoborus	56	186	74	105	19	19		12
Ceratopogonidae		19		6		37		12
Chironomidae								
Ablabesmyia		37		12				
Chironomus								
Cladotanytarsus								
Coelotanypus	56	74		43	19			6
Cricotopus								
Cryptochironomus			19	6	19			6
Cryptotendipes								
Dicrotendipes								
Epoicocladius	19			6				
Glyptotendipes								
Harnischia								
Labrundinia								
Micropsectra								
Orthocladius								
Parachironomus								
Paratendipes								
Pentaneura	19			6		19		6
Phaenopsectra								
Polypedium			19	6				
Procladius	186	205	37	142		74		25
Psectrocladius								
Rheotanytarsus								
Stenochironomus								
Stictochironomus								

UNITS = number per m².

TABLE N-4. Continued.

	22				23			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Chironomidae								
Tanytarsus			19	6				
Xenochironomus								
Unidentified	19	19		13				
TOTAL NUMBER OF ORGANISMS				1241				622
BIOMASS gm/m^2	28.6	4.22	1.34	11.4	3.39	0.43	0.30	1.37
BIOMASS gm/m^2 (clams)*								
SHANNON-WEAVER DIVERSITY INDEX				3.50				1.47
EVENNESS				1.06				0.57

* *No organisms collected*

** Biomass, clam meat, measured only when clams exceeded 0.5 cm length

UNITS = number per m^2.

TABLE N-5. Benthic macroinvertebrate taxa collected by Ponar dredge, Middle Black Warrior and Tombigbee Rivers, July 29 - August 1, 1979.

	1				2				3				4				5			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Turbellaria																				
Nematoda																				
Adenophorea																				
Bryozoa (colonies)																				
Mollusca																				
Gastropoda																				
Birgella subglobosa																				
Goniobasis																				
Gyraulus																			19	6
Laevapex																			93	31
Pyrgulopsis																				
Unidentified																				
Pelecypoda																				
Corbicula manilensis		74	37	37													37	856	1470	788
Unidentified																			19	6
Oligochaeta																				
Naididae							19	6												
Tubificidae	260	19	130	136	205	74	19	99	37	37	242	105		446	93	180	744	112	353	403
Unidentified																				
Hirudinea																				
Crustacea																				
Cladocera																				
Holopedium amazonicum																			19	6
Sida crystallina																				
Unidentified																				
Copepoda																				
Cyclopoida																				
Ostracoda																				
Isopoda																				
Asellus																				
Acarina																				
Unionicola																				
Unidentified																				
Insecta																				
Ephemeroptera																				
Baetis							19	6												
Caenis																				
Hexagenia											19	6					149			50
Stenonema										19		6								
Unidentified																				
Odonata																				
Unidentified																				
Megaloptera																				
Sialis																				
Coleoptera																				
Unidentified																				
Trichoptera																				
Cyrnellus	19	19	19	19						19		6								

UNITS = number per m².

TABLE N-5. Continued.

	1				2				3				4				5			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right*	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Trichoptera (continued)																				
Hydropsyche																				
Oecetis					19			6												
Diptera																				
Chaoboridae																				
Chaoborus	19	19	37	25					19		19	13		19		6				
Ceratopogonidae																	19		19	13
Chironomidae																				
Ablabesmyia																				
Chironomus																				
Cladotanytarsus																				
Coelotanypus																				
Cryptochironomus																			37	12
Cryptotendipes																				
Dicrotendipes																				
Einfeldia																			37	12
Harnischia																	56			19
Micropsectra																				
Orthocladius																				
Paratendipes																	19			6
Pentaneura		19		6																
Phaenopsectra																				
Polypedilum											19	6						37		12
Procladius																				
Psectrocladius																				
Rheotanytarsus	37	19	19	25																
Stictochironomus		19		6																
Tanytarsus																				
Thienemanniella																				
Xenochironomus															19	6				
Unidentified			112	37		19		6		37		12								
TOTAL NUMBER OF ORGANISMS				291				123				154				180				1364
BIOMASS gm/m²	0.22	0.34	0.21	0.26	0.24	0.11	0.11	0.15	0.05	0.05	0.13	0.08	0	0.45	0.15	0.30	2.73	0.29	1.19	1.40
BIOMASS gm/m² (clams)**																				
SHANNON-WEAVER DIVERSITY INDEX				2.37				1.10				1.69				0.63				1.74
EVENNESS				1.14				0.68				0.87				0.45				0.68

* No organisms collected in samples

** Biomass, clam meat, measured only when clams exceeded 0.5 cm in length.

UNITS = number per m².

TABLE N-5. Continued.

	6				7				8				9				10			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Turbellaria																				
Nematoda																		17		
Adenophorea	37		130	56							19	6								
Bryozoa (colonies)		19		6																
Mollusca																				
Gastropoda																				
[illegible] subglobosa																				
[illegible]																				
[illegible]																				
[illegible]																				
[illegible]																				
Unidentified											19	6								
Pelecypoda																				
[illegible] manilensis	149	186	149	161	167	502	130	266	19	298	242	186	130	37	167	111	68	539	130	246
Unidentified			74	25																
Oligochaeta																				
Naididae						56	186	81	19		74	31		93		31	56			19
Tubificidae	688	353	2450	1160	2180	2310	130	1540	1410	3520	614	1850	1890	93	3880	1950	892	112	260	421
Unidentified																				
Hirudinea	19		37	19											93	31				
Crustacea																				
Cladocera																				
Holopedium amazonicum		56		19																
Sida crystallina																				
Unidentified																				
Copepoda																				
Cyclopoida										19		6								
Ostracoda																				
Isopoda																				
Asellus																				
Acarina																				
[illegible]																				
Unidentified									37			12								
Insecta																				
Ephemeroptera																				
Baetis																				
Caenis																				
Hexagenia	19	56		25			19	6	37	56	56	50	130	167	56	68	56			19
Stenonema																				
Unidentified																				
Odonata																				
Unidentified					19			6												
Megaloptera																				
Sialis																				
Coleoptera																				
Unidentified																				
Trichoptera																				
Cyrnellus							112	37												

UNITS = number per m^2

TABLE N-5. Continued.

	6				7				8				9				10			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/2	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Trichoptera (continued)																				
Hydropsyche																				
Oecetis					19			6		19	37	19			19	6				
Diptera																				
Chaoboridae																				
Chaoborus	112	112	19	81		37	19	19	19	279	93	130	74	19	74	56	74	56	19	50
Ceratopogonidae		56	74	43	74	130		68			74	25	56	19	37	37			19	6
Chironomidae																				
Ablabesmyia			149	50		56		19												
Chironomus																				
[illegible]			37	12		56	19	25												
Coelotanypus	167	56	93	105		56	19	25	223	242		155	74	37	56	56	37			12
Cryptochironomus	19	37	37	31					19			6					19		19	13
Cryptotendipes									19			6								
Dicrotendipes	19		19	13		56	19	25												
Einfeldia																				
Harnischia			186	62	37	93	37	56	19			6			37	12	19			6
[illegible]											19	6								
Orthocladius			37	12																
Paratendipes										19	37	19			56	19				
Pentaneura										19		6	19	37	37	31				
Phaenopsectra									37			12								
Polypedilum			37	12		56		19		19	19	13								
Procladius	37	19	19	25			19	6		112		37	19		74	31	56			19
Psectrocladius			38	13																
Rheotanytarsus																				
Stictochironomus																				
Tanytarsus			539	180		93		31	56	37	19	37								
Thienemanniella																				
Xenochironomus																				
Unidentified		19	112	13		37		12	19		19	13						56		19
TOTAL NUMBER OF ORGANISMS				2222				2246				2670				2414				830
BIOMASS gm/m²	4.19	0.95	8.98	4.68	8.33	7.46	0.39	5.39	0.97	3.06	1.44	1.80	4.80	0.37	1.99	2.39	1.56	0.22	0.26	0.68
BIOMASS gm/m² (clams)**										85		28	102.0	102.0		68				
SHANNON-WEAVER DIVERSITY INDEX				2.81				1.91				2.12				1.33				2.04
EVENNESS				0.91				0.66				0.68				0.52				0.85

* No organisms collected in samples

** Biomass, clam meat, measured only when clams exceeded 0.5 cm in length.

UNITS = number per m².

TABLE N-5. Continued.

	12				13				14				15				16			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Turbellaria							17	6												
Nematoda																				
Adenophorea										19		6								
Bryozoa (colonies)						19		6												
Mollusca																				
Gastropoda																				
Birgella subglobosa																				
Goniobasis																	19		19	13
Gyraulus																				
Laevapex																				
Pseudosuccinea																				
Unidentified																				
Pelecypoda																				
Corbicula manilensis		37		12		484	19	168	37	56	19	37	56	446	167	223	19	279	37	109
Unidentified														19		6	19		130	50
Oligochaeta																				
Naididae	74			24						19		6	19			6				
Tubificidae	1710	688		799		112	167	93	298	130	335	254	5600	465	93	2053	1950	372	56	793
Unidentified			19	6																
Hirudinea		19		6					19			6								
Crustacea																				
Cladocera																				
Holopedium amazonicum																				
Sida crystallina									19			6	19			6				
Unidentified									19			6								
Copepoda																				
Cyclopoida																				
Ostracoda	19			6																
Isopoda																				
Asellus																				
Acarina																				
Unionicola		19		6							19	6		19	37	19				
Unidentified																				
Insecta																				
Ephemeroptera																				
Baetis																				
Caenis																				
Hexagenia									93			31	19	93		37		93		31
Stenonema																				
Unidentified																	37			12
Odonata																				
Unidentified																				
Megaloptera																				
Sialis																				
Coleoptera																				
Unidentified																				
Trichoptera																				
Cyrnellus									37	19		19	56		19	25	19		74	31

UNITS = number per m2.

TABLE N-5. Continued.

	12				13				14				15				16			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Trichoptera (continued)																				
[illegible]																				
[illegible]						19		6	130			43		37	19	19	19	19	19	19
Diptera																				
Chaoboridae																				
[illegible]	19	93		37		37	19	19	74	112	112	99	19	205	112	112		260	93	118
Ceratopogonidae	37			12			19	6	74			25	130	56	19	68	189	37		75
Chironomidae																				
Ablabesmyia													74			25	37		19	19
Chironomus													39			12				
[illegible]													279			93				
[illegible]	19			6					37		93	43	19	93		37	19	19		13
Cryptochironomus	56			19						19		6		19		6	130			43
Cryptotendipes																				
[illegible]							19	6			19	6								
[illegible]																				
Harnischia	279	19	19	106									353	19		124	112			37
[illegible]																				
[illegible]	74			25							19	6								
[illegible]																				
Pentaneura									19			6								
[illegible]																				
Polypedilum					51	19	19	30		19	19	13					149			50
Procladius					19	19		13	74		74	49	56	37		31		130		65
[illegible]					34			11												
Rheotanytarsus																			19	6
[illegible]																				
Tanytarsus	112			37							19	6	353			118	112	37		50
[illegible]																				
[illegible]																				
Unidentified					37			12									74			25
TOTAL NUMBER OF ORGANISMS				1113				376				655				2981				1559
BIOMASS gm/m^2	2.86	1.02	0.13	1.34	0.02	0.39	0.13	0.18	3.66	0.58	1.03	1.76	12.63	3.22	0.26	5.37	6.51	1.60	41.12	16.41
BIOMASS gm/m^2 (clams)**													1.33			0.44				
SHANNON-WEAVER DIVERSITY INDEX				1.72				2.48				3.20				2.03				2.87
EVENNESS				0.65				1.00				1.05				0.69				0.97

* No organisms collected in samples

** Biomass, clam meat, measured only when clams exceeded 0.5 cm in length.

UNITS = number per m^2.

TABLE N-5. Continued.

	17				18				19				20			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Turbellaria	34		17	12												
Nematoda																
Adenophorea			17	6			19	6								
Bryozoa (colonies)																
Mollusca																
Gastropoda																
Birgella subglobosa					19			6								
Goniobasis																
Gyraulus																
Laevapex																
Lepidopsis					19			6								
Unidentified																
Pelecypoda																
Corbicula manilensis	19	56		25	74	130	19	74		37	19	19				
Unidentified					19			6			19	6				
Oligochaeta																
Naididae																
Tubificidae		37	37	25	428		37	155	335	37	781	384	149	19	391	186
Unidentified																
Hirudinea					19			6								
Crustacea																
Cladocera																
Holopedium amazonicum																
Sida crystallina																
Unidentified																
Copepoda																
Cyclopoida																
Ostracoda															19	6
Isopoda																
Asellus																
Acarina																
Unionicola																
Unidentified																
Insecta																
Ephemeroptera																
Baetis														19		6
Caenis	19			6												
Hexagenia											484	161	56		112	56
Stenonema																
Unidentified			19	6									19		19	13
Odonata																
Unidentified																
Megaloptera																
Sialis															19	6
Coleoptera																
Unidentified											19	6				
Trichoptera																
Cyrnellus			37	12												

UNITS = number per m2.

TABLE N-5. Continued.

	17				18				19				20			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Trichoptera (continued)																
Hydropsyche			391	130		37		12								
Oecetis			19	6												
Diptera																
Chaoboridae																
Chaoborus					149	56	37	81	19		242	87		93	298	130
Ceratopogonidae	19			6	74			25			19	6	37		74	37
Chironomidae																
Ablabesmyia																
Chironomus																
Cladotanytarsus																
Coelotanypus					93		19	37	56		74	43			112	37
Cryptochironomus																
Cryptotendipes										37		12				
Dicrotendipes																
Einfeldia																
Harnischia																
Micropsectra											19	6				
Orthocladius																
Paratendipes																
Pentaneura											19	6				
Phaenopsectra													19		37	19
Polypedilum					19			6								
Procladius					19			6	37			12			37	12
Psectrocladius																
Rheotanytarsus			56	19												
Stictochironomus																
Tanytarsus																
Thienemanniella									19			6				
Xenochironomus			19	6										19		6
Unidentified									19			6				
TOTAL NUMBER OF ORGANISMS				264				402				760				514
BIOMASS gm/m^2	0.06	0.19	0.26	0.34	2.34	0.48	2.23	1.68	2.45	0.24	10.39	4.36	3.20	0.30	3.92	2.47
BIOMASS gm/m^2 (clams)**											0.58	0.19				
SHANNON-WEAVER DIVERSITY INDEX				2.62				2.64				2.27				2.66
EVENNESS				1.00				1.03				0.86				1.07

* No organisms collected in samples

** Biomass, clam meat, measured only when clams exceeded 0.5 cm in length.

UNITS = number per m^2.

TABLE N-5. Continued.

	21				22				23			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Turbellaria												
Nematoda												
Adenophorea			19	6			19	6		19		6
Bryozoa (colonies)												
Mollusca												
Gastropoda												
Birgella subglobosa					19			6				
Goniobasis												
Gyraulus												
Laevapex												
Pyrgulopsis												
Unidentified												
Pelecypoda												
Corbicula manilensis		19		6					19	93		37
Unidentified	37			12	150			50				
Oligochaeta												
Naididae												
Tubificidae	930		1250	727	335	37	1080	484	279	93	502	291
Unidentified												
Hirudinea					37			12				
Crustacea												
Cladocera												
Holopedium amazonicum												
Sida crystallina												
Unidentified												
Copepoda												
Cyclopoida												
Ostracoda												
Isopoda												
Asellus						19		6				
Acarina												
Unionicola							37	12			19	6
Unidentified												
Insecta												
Ephemeroptera												
Baetis												
Caenis												
Hexagenia		19	37	19	93	353	130	192		19		6
Stenonema												
Unidentified			19	6								
Odonata												
Unidentified												
Megaloptera												
Sialis												
Coleoptera												
Unidentified												
Trichoptera												
Cyrnellus										19		6

UNITS = number per m^2.

TABLE N-5. Continued.

	21				22				23			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Trichoptera (continued)												
Hydropsyche												
Oecetis												
Diptera												
Chaoboridae												
Chaoborus		205	19	75	37	186	37	87		186	74	87
Ceratopogonidae						56	93	50		74		25
Chironomidae												
Ablabesmyia												
Chironomus												
Cladotanytarsus												
Coelotanypus			37	12	37		56	31				
Cryptochironomus												
Cryptotendipes												
Dicrotendipes												
Einfeldia												
Harnischia												
Micropsectra												
Orthocladius												
Paratendipes												
Pentaneura			19	6	167			56				
Phaenopsectra												
Polypedilum					19			6				
Procladius					112	74		62	19	19		13
Psectrocladius												
Rheotanytarsus												
Stictochironomus											19	6
Tanytarsus			19	6								
Thienemanniella												
Xenochironomus												
Unidentified												
TOTAL NUMBER OF ORGANISMS				876				1060				483
BIOMASS gm/m^2	2.29	0.26	4.11	2.22	8.37	7.72	11.7	9.26	2.28	0.26	4.11	2.22
BIOMASS gm/m^2 (clams)**												
SHANNON-WEAVER DIVERSITY INDEX				1.05				2.60				1.92
EVENNESS				0.48				0.99				0.84

* No organisms collected in samples

** Biomass, clam meat, measured only when clams exceeded 0.5 cm in length.

UNITS = number per m^2.

TABLE N-6. Benthic macroinvertebrate taxa collected by Ponar dredge, Middle Black Warrior-Tombigbee Rivers, August 26 - 29, 1979.

STATION / TAXA	1				2				3				4				5			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Nematoda																				
Adenophorea		19		6																
Mollusca																				
Gastropoda																				
Birgella subglobosa																				
Laevipex																				
Pelecypoda																				
Corbicula manilensis	37	19	74	43		56		19		93		31		19	74	31	763	1230	2360	1451
Unidentified																				
Oligochaeta																				
Naididae									56			19								
Tubificidae	112	93	56	87	725	19	130	291	11	242	37	99		112		37			130	43
Hirudinea																				
Crustacea																				
Cladocera																				
Daphnia																				
Ilyocryptus																				
Sida crystallina																				
Copepoda																				
Cyclopoida																				
Ostracoda																				
Acarina																				
Unionicola																				
Insecta																				
Ephemeroptera																				
Caenis																				
Hexagenia																	19			6
Tricorythodes																				
Unidentified																				
Odonata																				
Argia																				
Dromogomphus																	19			6
Unidentified											19	6	19		19	12	37			12
Megaloptera																				
Sialis																				
Hemiptera																				
Corixidae																				
Coleoptera																				
Dubiraphia																				
Stenelmis																				

UNITS = number per m^2

TABLE N-6. Continued.

TAXA \ STATION	1				2				3				4				5			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Insecta (continued)																				
Trichoptera																				
Cyrnellus																				
Hydropsyche																				
Oecetis															19	6				
Unidentified																				
Diptera																				
Chaoboridae																				
Chaoborus										56		18								
Ceratopogonidae																				
Chironomidae																				
Ablabesmyia			37	12											19	6				
Chironomus																				
Cladotanytarsus																				
Coelotanypus									37			12								
Cricotopus			74	25					19			6							37	12
Cryptochironomus	19		74	30															37	12
Dicrotendipes	595		37	211					56	19		25								
Epoicocladius																				
Harnischia			19	6	19			6	19			6								
Micropsectra																				
Orthocladius	19		56	25																
Paratendipes																				
Pentaneura																				
Polypedilum	37	37		25	19	74	37	43	19			6								
Procladius			19	6																
Psectrocladius			19	6															19	6
Stempellina																				
Stenochironomus																				
Tanypus																				
Tanytarsus	19			6					37			12								
Tribelos																				
Xenochironomus									19			6								
Unidentified	112		74	62	37		19	19	93	19		37		19		6			37	12
TOTAL NUMBER OF ORGANISMS				550				378				283				104				1560
BIOMASS g/m^2	0.37	0.01	0.39		1.21	0.04	0.22		0.22	0.28	0.15		0.07	0.43	1.97		0.99	0.20	1.06	
BIOMASS g/m^2 (clams) *																				
SHANNON WEAVER DIVERSITY INDEX				2.70				1.03				2.88				2.24				0.54
EVENNESS				1.05				0.74				1.16				1.25				0.26

* biomass, clam meat, only measured when clams exceed 0.5 cm in diameter.

UNITS = number per m^2

TABLE N-6. Continued.

STATION / TAXA	6				7				8				9				10			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Nematoda																				
Adenophorea		112	93	68	130	93	19	81			167	56	19	37		19				
Mollusca																				
Gastropoda																				
Birgella subglobosa																			19	6
Laevipex																				
Pelecypoda																				
Corbicula manilensis	1100	279	670	683	186	316	502	335		112	354	155	279	56		112	279	614	521	471
Unidentified																				
Oligochaeta																				
Naididae																				
Tubificidae	298	539	4820	1886	1100	372	112	528	298	149	1990	812	2960	372	56	1129	130	112	484	242
Hirudinea			37	12																
Crustacea																				
Cladocera																				
Daphnia																				
Ilyocryptus							19	6												
Sida crystallina																				
Copepoda																				
Cyclopoida			19	6						37		12		19		6				
Ostracoda	19		74	31	19			6			56	19								
Acarina																				
Unionicola											19	6					19			6
Insecta																				
Ephemeroptera																				
Caenis											19	6					19			6
Hexagenia	595	242	186	341	149	205	130	161	56	205		87	1040	279		440	56	19	1860	645
Tricorythodes																				
Unidentified																				
Odonata																				
Argia																				
Dromogomphus																				
Unidentified																				
Megaloptera																				
Sialis	19			6																
Hemiptera																				
Corixidae																				
Coleoptera																				
Dubiraphia																				
Stenelmis																				

UNITS = number per m^2

TABLE N-6. Continued.

STATION / TAXA	6 Right	6 Mid	6 Left	6 Ave/m^2	7 Right	7 Mid	7 Left	7 Ave/m^2	8 Right	8 Mid	8 Left	8 Ave/m^2	9 Right	9 Mid	9 Left	9 Ave/m^2	10 Right	10 Mid	10 Left	10 Ave/m^2
Insecta (continued)																				
Trichoptera																				
Cyrnellus							19	6												
Hydropsyche																				
Oecetis	37			12						56	19	25		19		6		19	19	12
Unidentified																				
Diptera																				
Chaoboridae																				
Chaoborus	428	93	19	180	465	391	260	372	725	763	74	521	335	1023	19	459	242	19	130	130
Ceratopogonidae	74	56	205	112	19		37	19		93	112	68	37	149		62			19	6
Chironomidae																				
Ablabesmyia										19		6								
Chironomus									19			6								
Cladotanytarsus			483	161							223	74	37			12				
Coelotanypus	37	37	149	74	93	74	37	68	298	37	19	118	68	56		41			56	19
Cricotopus																				
Cryptochironomus			167	56	19			6					56			19	19		19	12
Dicrotendipes			800	267			19	6					19			6				
Epoicocladius									19			6								
Harnischia		37	632	223			19	6	56		74	43	19			6				
Micropsectra																				
Orthocladius			167	56																
Paratendipes							19	6												
Pentaneura					37		19	19	19			6	130			43			149	50
Polypedilum			19	6					19	19	37	25								
Procladius	37	37	186	87					37			12	19	37		19	19	19		12
Psectrocladius																				
Stempellina																		19		6
Stenochironomus																				
Tanypus																				
Tanytarsus			316	105	19			6		19	112	44	37			12			37	12
Tribelos																				
Xenochironomus																				
Unidentified	56			19					19	19	112	50		19	19	12	19			6
TOTAL NUMBER OF ORGANISMS				4391				1631				2157				2420				1641
BIOMASS g/m^2	3.79	1.84	9.99		0.22	1.38	4.71		3.94	2.99	2.74		11.80	3.71	0.02		0.84	0.54	9.38	
BIOMASS g/m^2 (clams) *																				
SHANNON WEAVER DIVERSITY INDEX				2.04				2.63				2.93				2.32				2.33
EVENNESS				0.67				0.95				0.96				0.84				0.86

* biomass, clam meat, only measured when clams exceed 0.5 cm in diameter.

UNITS = number per m^2

TABLE N-6. Continued.

STATION	12				13				14				15				16			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Nematoda																				
Adenophorea	502		19	174	670	149	37	285	37			12	223	74	112	136		167	19	62
Mollusca																				
Gastropoda																				
Birgella subglobosa														56		19				
Laevipex																				
Pelecypoda																				
Corbicula manilensis	744	744	56	515	279	484	37	267	112	112	74	99	112	74	56	81	112	186		99
Unidentified														19		6				
Oligochaeta																				
Naididae																				
Tubificidae	763	688	1100	850	5770	2920	911	3200	1100	502	1450	1017	3920	1660	762	2114	1880	1840	1640	1787
Hirudinea		19		6															19	6
Crustacea																				
Cladocera																				
Daphnia																				
Ilyocryptus																				
Sida crystallina															19	6				
Copepoda																				
Cyclopoida															19	6		19		6
Ostracoda	19			6														19		6
Acarina																				
Unionicola													19			6		19	19	12
Insecta																				
Ephemeroptera																				
Caenis											37	12								
Hexagenia	74	19		31	19	372	279	223	19	37	19	25	19	260	19	99		279		93
Tricorythodes									19			6								
Unidentified	19			6					37			12			19	6				
Odonata																				
Argia																				
Dromogomphus																				
Unidentified							74	25	19			6					19			6
Megaloptera																				
Sialis																				
Hemiptera																				
Corixidae													19			6				
Coleoptera																				
Dubiraphia																				
Stenelmis																				

UNITS = number per m^2.

TABLE N-6 . Continued.

TAXA \ STATION	12				13				14				15				16			
	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²	Right	Mid	Left	Ave/m²
Insec· ·ontinued)																				
Trichoptera																				
Cyrnellus															93	31				
Hydropsyche							19	6												
Oecetis	19			6					37		19	19					19		37	19
Unidentified																				
Diptera																				
Chaoboridae																				
Chaoborus	130	130	298	186	37	260	93	130	19	428	205	217	149	502		217	74	502	56	211
Ceratopogonidae	149	19		56	112	19	37	155	37		19	19	74	93	130	99	74	130	167	124
Chironomidae																				
Ablabesmyia	37			12			19	6			19	6	56			19	19			6
Chironomus																				12
Cladotanytarsus													37	74	37	49	74			25
Coelotanypus	37			12		56	74	40	19	56	19	31		56	19	25	19	56	56	44
Cricotopus	93			31	74			25	56			19							74	25
Cryptochironomus									37			12	56	19		25			74	25
Dicrotendipes	205			68	37			12	56		19	25	56		74	43	19			6
Epoicocladius																				
Harnischia					149		19	56	74			25	112		37	50	37		409	141
Micropsectra						19	19	12			19	6							37	12
Orthocladius	37			12																
Paratendipes					112		19	43					37			12			74	25
Pentaneura					74	19	19	37							37	12				
Polypedilum	56			19	74	19	19	37	19		56	25	37		37	25	93	19	74	62
Procladius	149	19	37	168			19	6	56	19	19	31	19	93	56	56	51	93	19	54
Psectrocladius																				
Stempellina																				
Stenochironomus																				
Tanypus																				
Tanytarsus	37			12							37	12			19	6	19			6
Tribelos																				
Xenochironomus																				
Unidentified					37			12	112		19	43	56	18	112	62	37		74	37
TOTAL NUMBER OF ORGANISMS				2170				4577				1679				3216				2929
BIOMASS g/m²	1.53	0.47	3.92		10.30	13.00	4.54		0.76	1.30	3.01		9.08	5.34	0.60		2.51	10.10	2.23	
BIOMASS g/m² (clams) *																				
SHANNON WEAVER DIVERSITY INDEX				2.50				1.62				2.25				1.97				2.20
EVENNESS				0.87				0.56				0.74				0.61				0.70

* biomass, clam meat, only measured when clams exceed 0.5 cm in diameter.

UNITS = number per m²

TABLE N-6. Continued.

STATION / TAXA	17 Right	17 Mid	17 Left	17 Ave/m²	18 Right	18 Mid	18 Left	18 Ave/m²	19 Right	19 Mid	19 Left	19 Ave/m²	20 Right	20 Mid	20 Left	20 Ave/m²	21 Right	21 Mid	21 Left	21 Ave/m²
Turbellaria			19	6																
Nematoda																				
Adenophorea		56		19					19			6		37	19	19				
Mollusca																				
Gastropoda																				
Birgella subglobosa																				
Laevipex	19			6																
Pelecypoda																				
Corbicula manilensis	186	19	56	87	205	298		168	19			6		19		6		19		6
Unidentified																				
Oligochaeta																				
Naididae																				
Tubificidae	93		74	56	1040	56	93	396	725	93	354	391	595	112	186	298	1620		[illegible]	571
Hirudinea										19		6								
Crustacea																				
Cladocera																				
Daphnia	37			12																
Ilyocryptus																				
Sida crystallina																				
Copepoda																				
Cyclopoida														37		12				
Ostracoda	37			12		19		6	19			6	19		37	19				
Acarina																				
Unionicola	37			12						19		6					37			12
Insecta																				
Ephemeroptera																				
Caenis	242			81		19		6									19			6
Hexagenia	186			62		93	19	37	223	19	558	267	149		725	291	706	56	763	508
Tricorythodes					56			19												
Unidentified																				
Odonata																				
Argia																				
Dromogomphus																				
Unidentified	19			6						19		6								
Megaloptera																				
Sialis																				
Hemiptera																				
Corixidae																				
Coleoptera																				
Dubiraphia	19			6	19			6												
Stenelmis											167	56						19	74	31

UNITS = number per m^2

TABLE N-6. Continued.

TAXA \ STATION	17				18				19				20				21			
	Right	Mid	Left	Ave/m2	Right	Mid	Left	Ave/m2	Right	Mid	Left	Ave/m2	Right	Mid	Left	Ave/m2	Right	Mid	Left	Ave/m2
Insecta (continued)																				
Trichoptera																				
Cymellus	37			12																
Hydropsyche																				
Oecetis	74			25		19		6		19		6	37		19	19		19		6
Unidentified						19		6		19		6	19			6				
Diptera																				
Chaoboridae																				
Chaoborus	558		19	192	74	37	2t0	124	465	167	149	260	354	2027	409	930	298	1930	930	1073
Ceratopogonidae											37	12			56	19	93	19	37	50
Chironomidae																				
Ablabesmyia	56			19	19			6	19			6			19	6				
Chironomus																				
Cladotanytarsus														19	19	12				
Coelotanypus					19	56	19	31										56	19	25
Cricotopus	56			19																
Cryptochironomus		112	37	50	19	19		12			19	6					37			12
Dicrotendipes	298			99	37			12	19		19	12	19			6				
Epoicocladius															19	6				
Harnischia														19	37	19	37	19		19
Micropsectra	93			31																
Orthocladius																				
Paratendipes	56			19	19	19		12			19	6	19		37	19	130	19	37	62
Pentaneura										19	130	50	19		149	56	205		186	130
Polypedilum	93	37		43					19			6	130	19		59	74			25
Procladius	56			19					37		19	19			19	9	19	74	56	50
Psectrocladius																				
Stempellina																				
Stenochironomus																		19		6
Tanypus														37		12			19	6
Tanytarsus	205			68					19		19	12	56			19	74			25
Tribelos											19	6								
Xenochironomus	93			31																
Unidentified	56	56	19	44	37			12	19	37	19	31		37		12		19		6
TOTAL NUMBER OF ORGANISMS				1036				866				1180				186				2629
BIOMASS g/m2	0.37	0.06	0.19		5.71	0.09	0.11		3.64	1.79	7.18		3.46	3.05	14.50		16.10	2.33	2.38	
BIOMASS g/m2 (clams) *			4.84																	
SHANNON WEAVER DIVERSITY INDEX				3.44				2.44				2.68				2.47				2.19
EVENNESS				1.06				0.90				0.87				0.81				0.74

* biomass, clam meat, only measured when clams exceed 0.5 cm in diameter.

UNITS = number per m^2

TABLE N-6. Continued.

TAXA \ STATION	22				23				RB-8			
	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2	Right	Mid	Left	Ave/m^2
Nematoda												
Adenophorea							74	25				
Mollusca												
Gastropoda												
Pirjella subglobosa												
Laevapex												
Pelecypoda												
Corbicula manilensis	74	167	56	99	130	112		81	37			12
Unidentified							19	6			19	6
Oligochaeta												
Naididae							19	6				
Tubificidae	130	539	4520	1730	279		986	422	354	205	279	279
Hirudinea												
Crustacea												
Cladocera												
Daphnia												
Ilyocryptus												
Sida crystallina												
Copepoda												
Cyclopoida						19		6				
Ostracoda		242		81					56			19
Acarina												
Unionicola												
Insecta												
Ephemeroptera												
Caenis			13	6								
Hexagenia	37	391		143	56		37	31	260		167	142
Tricorythodes												
Unidentified												
Odonata												
Argia												
Dromogomphus												
Unidentified		13		6								
Megaloptera												
Sialis												
Hemiptera												
Corixidae												
Coleoptera												
Dubiraphia												
Stenelmis												

UNITS = number per m^2

TABLE N-6 . Continued.

TAXA \ STATION	22 Right	22 Mid	22 Left	22 Ave/m^2	23 Right	23 Mid	23 Left	23 Ave/m^2	RR-8 Right	RR-8 Mid	RR-8 Left	RR-8 Ave/m^2
Insecta (continued)												
Trichoptera												
Cyrnellus										19		6
Hydropsyche												
Oecetis	12		19	12								
Unidentified												
Diptera												
Chaoboridae												
Chaoborus	3400	1430	56	1629	354	1410	372	2045		837	298	378
Ceratopogonidae		130	56	62		19		6	37			12
Chironomidae												
Ablabesmyia												
Chironomus												
Cladotanytarsus							37	12	37			12
Coelotanypus	260			87		56		19	112	74	19	68
Cricotopus												
Cryptochironomus			56	19								
Dicrotendipes			260	86								
Epoicocladius												
Harnischia			130	43	19			6				
Micropsectra	19			6			19	6				
Orthocladius												
Paratendipes	19	37	130	62		19	19	12	19		19	12
Pentaneura									112			37
Polypedilum	74		205	93			19	6			19	6
Procladius	37	37		25					37	112		50
Psectrocladius												
Stempellina												
Stenochironomus												
Tanypus												
Tanytarsus			130	43	19		19	12				
Tribelos												
Xenochironomus												
Unidentified	37		130	56	19		56	31			19	6
TOTAL NUMBER OF ORGANISMS				4288				2730				1040
BIOMASS g/m^2	6.44	4.78	10.50		1.77	1.58	1.66		4.87	1.69	1.56	
BIOMASS g/m^2 (clams) *												
SHANNON WEAVER DIVERSITY INDEX				1.95				1.30				2.59
EVENNESS				0.67				0.46				0.99
* biomass, clam meat, only measured when clams exceed 0.5 cm in diameter.												

UNITS = number per m^2

APPENDIX O

MULTIPLE PLATE SAMPLER MACROINVERTEBRATES

TABLE O-1. Macroinvertebrates collected by multiple plate samplers, Black Warrior-Tombigbee Rivers, August 27 - 31, 1978.

TAXA \ STATION	23	22	16	14*	9	8*	7	6	5	1**
Coelenterata										
Hydra	31				69				8	
Turbellaria								15		
Nematoda										
Unidentified								15		
Mollusca										
Gastropoda										
Gyraulus								8		
Pelecypoda										
Corbicula manilensis		8					8	8		
Oligochaeta										
Naididae	23	8	238		8			261	492	631
Crustacea										
Cladocera										
Sida crystallina							8	15		
Unidentified										8
Ostracoda	15									
Insecta										
Ephemeroptera										
Caenis							8		8	
Stenonema									38	
Tricorythodes									54	
Odonata										
Argia								31		
Dromogomphus spoliatus									8	
Neurocordulia molesta									8	
Trichoptera										
Cyrnellus	1180	630	653		669		930	392	292	408
Diptera										
Chaoboridae										
Chaoborus							954	745	538	
Ceratopogonidae	1249	646	891		746					
Chironomidae										
Ablabesmyia	31	138	15				69	154	69	69
Chironomini sp. 1			92		15			16		
Cricotopus			61							61
Dicrotendipes	1320	961	1050		784		323	946	1890	1430
Endochironomus								192		
Glyptotendipes	38	108	184		31			3010	477	
Tribelos	192	192	92		61		46	315	61	61
Unidentified		31	31						61	
TOTAL NUMBER OF ORGANISMS	4079	2722	3307		2383		2346	6123	4874	2668
BIOMASS g/m²	2.230	1.384	1.446		1.661		2.361	6.921	3.806	2.015
SHANNON-WEAVER DIVERSITY INDEX	2.02	2.31	2.49		2.01		1.80	2.40	2.43	1.80
EVENNESS	0.92	1.05	1.08		0.96		0.86	0.39	0.92	0.92

* No samplers recovered from this station

** Examined due to AGP results

UNITS = number per m^2

TABLE O-2. Macroinvertebrates collected by multiple plate sampler, Middle Black Warrior-Tombigbee Rivers, February 27 - March 2, 1979.

TAXA \ STATION	1*	5*	6	7*	8	13*	16*	18	22*	23
Turbellaria					7					
Nematoda										
Adenophorea			21		7					
Mollusca										
Gastropoda										
Gyraulus					7					•
Pelecypoda										
Corbicula manilensis					21					
Oligochaeta										
Naididae			14		155					1
Tubificidae			7							
Crustacea										
Amphipoda										
Gammarus					7					
Hyallela azteca					7					
Isopoda										
Asellus					21					
Insecta										
Ephemeroptera										
Baetis								49		42
Caenis								7		
Heptagenia								14		7
Isonychia										21
Stenonema								35		
Odonata										
Enallagma					7					
Macromia					7					
Neurocordulia molesta								7		
Plecoptera										
Acroneuria								21		
Prostoia								7		
Trichoptera										
Agraylea								7		
Cernotina			21		21					
Unidentified								7		
Diptera										
Ceratopogonidae					21					
Simuliidae										
Simulium			7					112		56
Chironomidae										
Ablabesmyia								21		
Chironomini sp. A (Roback)			14							
Chironomus					7					

*Not recovered due to flood conditions.

UNITS = number per m^2.

TABLE O-2. Continued.

TAXA \ STATION	1*	5*	6	7*	8	13*	16*	18	22*	23
Chironomidae										
Conchapelopia										14
Cricotopus			169		35			239		161
Cryptochironomus					7					
Dicrotendipes			49		35			35		147
Einfeldia										28
Endochironomus										
Glyptotendipes			35		35					14
Pentaneura			7							
Phaenopsectra					7					
Polypedilum			134		49			136		91
Psectrocladius			35							14
Rheocricotopus			35					35		14
Rheotanytarsus					7					63
Tanytarsus			35		56			21		91
Thienemanniella								56		
Tribelos					7					
Unidentified			35		7			21		28
TOTAL NUMBER OF ORGANISMS			618		540			852		792
SHANNON-WEAVER DIVERSITY INDEX			3.25		3.72			3.43		3.38
EVENNESS			1.20		1.88			1.16		1.22

*Not recovered due to flood conditions.

UNITS = number per m^2.

TABLE 0-3. Macroinvertebrates collected by multiple plate sampler, Middle Black Warrior-Tombigbee Rivers, June 17-20, 1979.

TAXA \ STATION	1*	5	6	7	8*	13	16	18	22	23
Coelenterata										
Hydra		19		29					10	
Nematoda										
Adenophorea						19				
Bryozoa (colonies)							10		10	
Mollusca										
Gastropoda										
Gyraulus						106				
Physa						10				
Pelecypoda										
Corbicula manilensis			19			10				
Oligochaeta										
Naididae		423		29		10	106			
Tubificidae						10				10
Crustacea										
Cladocera										
Daphnia				19						
Diaphanosoma				19						
Sida crystallina				19						
Copepoda										
Calanoida										
Diaptomus				10						
Cyclopoida				10						
Amphipoda										
Gammarus									10	
Hyalella azteca				19						
Insecta										
Ephemeroptera										
Baetis								29		
Caenis				10		19		39		
Isonychia								19		
Stenonema			10	19				173	58	29
Tricorythodes								96		
Odonata										
Argia				10		19				
Neurocordulia			10							
Unidentified						10		10		
Coleoptera										
Stenelmis								10		
Trichoptera										
Agraylea			10	19						
Cheumatopsyche		240		48		10	19	269		154
Cyrnellus		38	962	895		67	1440	192	577	837
Hydropsyche		29		38			490	48		1150
Hydroptila		10								
Neureclipsis		10						558		
Oecetis								23		

Units = number per m^2

TABLE O-3. Continued.

TAXA \ STATION	1*	5	6	7	8*	13	16	18	22	23
Trichoptera (continued)										
Potamyia								164		
Unidentified**		260		67		10	38	115		1330
Diptera										
Empididae		58						10		
Ceratopogonidae			10			19				
Simuliidae										
Simulium								10		
Chironomidae										
Ablabesmyia			741	202		19	192	125	58	
Conchapelopia		38								
Cricotopus						19				
Dicrotendipes		664	1390	1000		96	866		192	240
Einfeldia		77					38			
Endochironomus						19				
Eukiefferiella		77						29		
Glyptotendipes			38	77		58	115		19	
Micropsectra								29		
Orthocladius				164		19				
Phaenopsectra				202		38	38		19	
Polypedilum		943		77		19	154	125	19	144
Procladius									67	
Psectrocladius		38	164	38			38			48
Pseudochironomus			164	125			38			
Rheotanytarsus		269						67		289
Stenochironomus			87	10						
Thienemanniella		38								
Tribelos			250	38		520	77	29	19	
Unidentified		38		77		19	115	29		
Total Number of Organisms		3270	3860	3270		1140	3770	2200	1060	4230
Shannon Weaver Diversity Index		3.12	2.45	3.25		3.15	2.78	3.70	2.24	2.48
Evenness		1.08	0.95	0.98		1.01	1.00	1.18	0.90	1.08

*Samplers not recovered
**Organisms too immature for identification

Units = number per m^2

TABLE 0-4. Macroinvertebrates collected by multiple plate sampler, Middle Black Warrior-Tombigbee Rivers, October 1 - 3, 1979.

TAXA \ STATION	1	5	6	7	8	13	16	18	22	23
Turbellaria								7		28
Nematoda										
Adenophorea			14		7	7	42	7		63
Mollusca										
Gastropoda										
Laevapex										7
Pleurocera									7	
Pelecypoda										
Corbicula manilensis			7		14					
Unidentified					49					
Oligochaeta										
Naididae	21			35		14	63	14	28	246
Crustacea										
Cladocera										
Sida crystallina					7				42	
Ostracoda										
Unidentified					84				56	14
Amphipoda										
Hyalella azteca								7		
Acarina										
Unionicola					35					
Insecta										
Emphemeroptera										
Baetis		7						28		63
Caenis								7		
Isonychia								7		
Stenonema		14						49		7
Tricorythodes		70	7	14				49	7	
Unidentified								127		
Odonata										
Argia	14				35					
Neurocordulia		14								
Unidentified					14					
Coleoptera										
Stenelmis								7		
Trichoptera										
Cheumatopsyche						7		21	7	1324
Chimarra	253	28	1300	1160	359	1250	2390	859	1010	500
Hydropsyche	21	557				99	21	401		1155
Neureclipsis								155		
Unidentified		120						35		
Diptera										
Empididae		7						7		7
Simuliidae										
Simulium										21

UNITS = number per m^2

TABLE O-4. Continued.

TAXA \ STATION	1	5	6	7	8	13	16	18	22	23
Chironomidae										
Ablabesmyia	15			93	82			32	62	55
Conchapelopia								32		
Cricotopus	29	130		93	41		45			
Dicrotendipes	338	261	563	864	396	374	450	63	82	664
Glyptotendipes						27			21	55
Orthocladius					14					
Parachironomus					14					
Polypedilum		14			14	80		155		166
Procladius			26		14					
Pseudochironomus		14					45		103	
Rheotanytarsus		29						155		
Stenochironomus	29	91				204	14	91		28
Tanytarsus						27				
Tribelos	88		52		82		45	246		
Unidentified	15	14			27	27			21	
TOTAL NUMBER OF ORGANISMS	823	1328	1971	2261	1288	2119	3115	2513	1449	4403
SHANNON-WEAVER DIVERSITY INDEX	2.24	2.63	1.11	1.54	2.93	1.88	1.15	3.27	1.70	2.74
EVENNESS	1.02	1.00	0.62	0.86	1.03	0.81	0.55	1.03	0.71	0.97

UNITS = number per m^2

APPENDIX P

ALGAL GROWTH POTENTIAL TESTS

TABLE P-1. Algal growth potential (AGP) test results, Middle Black Warrior-Tombigbee Rivers, July 30 - August 4, 1978.

Station		Nutrients Added: P	N	P + N	EDTA	EDTA + P	EDTA + N	EDTA + P + N	Control
2	*1	<1	<1	<1	<1	<1	<1	<1	<1
	*2	<1	<1	<1	<1	<1	<1	<1	<1
	*3	<1	<1	<1	<1	<1	<1	<1	<1
5	1	103	<1	84	<1	137	<1	253	<1
	2	76	<1	75	<1	108	<1	213	<1
	3	59	<1	81	<1	106	<1	122	<1
9	1	148	12	106	6	<1	31	<1	16
	2	151	8	119	19	74	21	300	4
	3	110	21	304	<1	<1	<1	<1	<1
11	1	86	2	182	2	131	<1	187	1
	2	70	<1	369	1	146	<1	242	2
	3	132	2	197	1	150	<1	<1	<1
15	1	185	3	353	35	151	2	393	2
	2	145	6	377	2	200	2	385	<1
	3	159	3	353	3	242	66	389	<1
17	1	121	51	263	18	113	31	445	13
	2	145	1	123	20	109	26	333	14
	3	134	23	129	26	109	12	381	11

*1, 2, 3 = triplicate tests.
Units = cells per mℓ x 10^{-4}

TABLE P-1. Continued.

Station		P	N	P + N	EDTA	EDTA + P	EDTA + N	EDTA + P + N	Control
		Nutrients Added							
21	1	99	23	120	8	111	320	406	<1
	2	131	40	314	23	95	11	335	24
	3	67	14	73	14	<1	14	234	1
23	1	116	<1	152	144	139	62	3	14
	2	1[illegible]0	1	142	4	127	<1	205	3
	3	122	<1	206	1	167	6	340	95

Units = cells per mℓ x 10^{-4}

TABLE P-2. Physical-chemical measurements of algal growth potential (AGP) raw water samples, Middle Black Warrior-Tombigbee Rivers, July 30 - August 4, 1978.

PARAMETER/STATION NO.		2	5	9	11	15	17	21	23
Total Kjeldahl Nitrogen (mg/l)	Before*	0.3	0.2	0.5	1.1	0.7	0.2	0.1	0.2
	After*	0.3	<0.1	0.5	0.4	0.8	0.1	0.1	0.1
Ammonia (mg/l)	Before	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
	After	0.03	0.03	0.03	0.04	0.08	0.04	0.04	0.11
Total Phosphorus (mg/l)	Before	<0.01	0.04	0.04	0.13	0.07	0.06	0.05	0.03
	After	<0.01	<0.01	0.03	0.01	0.07	0.02	0.02	<0.01
Dissolved Orthophosphates (mg/l)	Before	<0.001	0.020	0.013	0.014	0.025	0.027	0.019	0.014
	After	<0.001	0.002	0.010	0.005	0.001	<0.001	0.004	<0.001
Nitrate-Nitrite (mg/l)	Before	0.55	0.53	0.27	-	0.30	0.12	<0.01	0.18
	After	0.41	0.55	0.23	0.28	0.32	0.09	0.01	0.22
Specific Conductance (µmhos/cm)	Before	180	200	180	180	165	410	140	150
	After	200	190	175	175	170	200	160	140
pH (S.U.)	Before	7.3	7.5	7.3	7.4	7.4	8.1	8.9	7.8
	After	7.4	7.4	7.5	7.5	6.3	8.7	8.8	8.2

*Before and after autoclaving sample.

TABLE P-3. Algal growth potential (AGP) test results, Middle Black Warrior-Tombigbee River, May , 1979.

Station		P	N	P + N	EDTA	EDTA + P	EDTA + N	EDTA + P + N	Control
		Nutrients Added							
2	*1	35	131	71	74	81	82	86	86
	*2	138	134	76	50	119	66	136	5
	*3	109	12	37	16	65	60	83	38
5	1	203	81	91	60	119	19	60	141
	2	58	105	107	22	184	109	96	137
	3	237	23	104	15	189	110	225	45
9	1	112	39	56	55	57	20	89	30
	2	31	29	167	38	34	9	72	16
	3	33	14	36	103	91	21	41	189
11	1	22	7	67	20	119	16	48	56
	2	100	23	35	8	40	23	151	31
	3	142	38	26	23	79	8	203	20
15	1	73	39	55	9	104	27	81	50
	2	61	9	52	8	44	24	91	5
	3	66	33	51	55	17	58	69	33
17	1	205	351	376	146	236	365	372	166
	2	135	321	440	236	204	411	458	157
	3	190	323	406	222	286	356	388	187

Units = cells per mℓ x 10^{-4}
*1, 2, 3 = triplicate tests

TABLE P-3. CONTINUED.

Station		P	N	P + N	EDTA	EDTA + P	EDTA + N	EDTA + P + N	Control
	1	112	134	89	38	157	25	282	37
21	2	78	32	121	70	189	225	82	39
	3	111	31	126	37	91	51	149	197
	1	110	77	82	127	58	7	211	16
23	2	125	32	95	13	113	16	226	92
	3	95	5	72	11	122	11	61	105

Nutrients Added

Units = cells per mℓ x 10^{-4}

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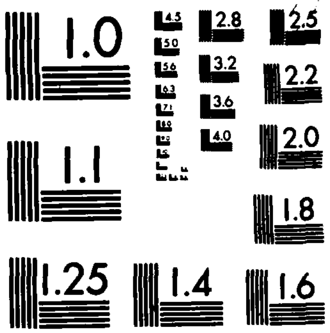
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0

TABLE P-4. Physical-chemical measurements of algal growth potential (AGP) raw water samples, Middle Black Warrior-Tombigbee Rivers, May 13 - 16, 1979.

PARAMETER/STA. #		2	5	9	11	15	17	21	23
Total Kjeldahl Nitrogen (mg/ℓ)	Before*	0.5	0.4	0.6	0.5	0.5	0.8	0.8	0.8
	After	0.4	0.5	0.6	0.7	0.5	0.6	0.9	0.6
Ammonia (mg/ℓ)	Before	0.07	0.07	0.15	0.13	0.10	0.11	0.08	0.11
	After	0.11	0.11	0.10	0.14	0.21	0.16	0.19	0.26
Total Phosphorus (mg/ℓ)	Before	0.02	0.03	0.10	0.03	0.06	0.09	0.15	0.04
	After	0.02	0.13	0.02	0.02	0.02	0.30	0.15	0.08
Dissolved Orthophosphates (mg/ℓ)	Before	0.015	0.022	0.021	0.034	0.018	0.053	0.062	0.042
	After	0.029	0.089	0.027	0.036	0.037	0.205	0.083	0.062
Nitrate-Nitrite (mg/ℓ)	Before	0.67	0.74	0.70	0.68	0.76	0.19	0.23	0.82
	After	0.74	0.80	0.74	0.76	1.02	0.32	0.29	0.95
Specific Conductance (µmhos/cm)	Before	126	129	142	148	142	95	111	136
	After	139	151	166	160	181	113	128	160
pH (S. U.)	Before	6.9	6.8	7.0	7.0	7.0	6.8	7.1	7.3
	After	8.5	8.4	8.9	8.8	8.5	8.9	8.9	9.0

*Before and after autoclaving

TABLE P-5. Algal growth potential (AGP) test results, Middle Black Warrior-Tombigbee Rivers, August 26 - 29, 1979.

Station		Nutrients Added P	N	P + N	EDTA	EDTA + P	EDTA + N	EDTA + P + N	Control
2	*1	9	< 1	6	<1	11	3	4	3
	*2	13	4	4	3	14	3	8	4
	*3	19	3	6	6	5	4	8	4
9	1	9	3	9	3	5	2	8	5
	2	3	4	7	4	8	5	14	1
	3	11	4	10	1	4	<1	7	3
11	1	8	6	12	5	14	2	14	2
	2	7	5	11	4	16	7	9	4
	3	8	2	9	1	7	2	7	6
15	1	52	15	57	34	74	38	58	35
	2	71	21	81	35	68	38	50	25
	3	59	35	79	43	80	47	84	12
17	1	15	14	22	8	12	7	26	8
	2	11	11	16	4	18	12	16	12
	3	17	10	19	12	18	11	25	14
21	1	28	5	11	9	14	8	12	11
	2	22	7	23	14	25	7	30	7
	3	12	5	27	6	24	8	23	5
23	1	13	4	8	10	17	14	10	8
	2	11	8	9	4	10	8	15	3
	3	13	3	6	15	9	10	13	3

*1, 2, 3 = triplicate tests.
Units = cells per mℓ x 10^{-4}

TABLE P-6. Physical-chemical measurements of algal growth potential (AGP) raw water samples, Middle Black Warrior-Tombigbee Rivers, August 26 - 29, 1979.

PARAMETER/STA. #		2	5	9	11	15	17	21	23
Total Kjeldahl Nitrogen (mg/l)	Before*	0.2	No Sample	0.4	0.3	0.6	0.4	0.4	0.6
	After	0.5	collected	0.4	0.5	0.6	0.5	0.3	0.6
Ammonia (mg/l)	Before	0.09	---	0.07	0.04	0.17	0.11	0.10	0.17
	After	0.15	---	0.06	0.09	0.23	0.14	0.04	0.26
Total Phosphorus (mg/l)	Before	0.01	---	0.04	0.04	0.02	0.04	0.05	0.05
	After	0.01	---	0.05	0.04	0.03	0.06	0.07	0.07
Dissolved Orthophosphates (mg/l)	Before	0.118	---	0.019	0.028	0.003	0.109	0.008	0.008
	After	0.166	---	0.023	0.027	0.017	0.287	0.030	0.022
Nitrate-Nitrite (mg/l)	Before	0.68	---	0.40	0.37	0.44	0.14	0.05	0.17
	After	0.78	---	0.43	0.42	0.50	0.20	0.06	0.23
Specific Conductance (μmhos/cm)	Before	220	---	190	198	178	164	166	147
	After	236	---	214	223	214	175	187	226
pH (S.U.)	Before	7.1	---	7.4	7.6	7.5	7.4	7.8	7.6
	After	7.3	---	8.6	9.0	8.5	8.9	9.1	8.6

* Before and after autoclaving sample.

APPENDIX Q

AQUATIC MACROPHYTE DISTRIBUTION

TABLE Q-1. Alaphabetical Listing of Names for Aquatic Macrophytes Observed Between R-1 and R-9 (Warrior Lake), Middle Black Warrior and Tombigbee Rivers, September, 1978

NUMBER*	SCIENTIFIC NAME	COMMON NAME	HABIT
1	*Alternanthera philoxeroides*	Alligator Weed	Emergent-Floating
2	*Boehmeria cylindrica*	False Nettle	Emergent
3	*Cephalanthus occidentalis*	Button-bush	Emergent
4	*Ceratophyllum* sp.	Coon-tail	Submerged
5	*Chara* sp.	Hornwort	Submerged
6	*Cuscuta* sp.	Dodder	Emergent**
7	*Cyperus erythrorhizos*	Sedge	Emergent
8	*Eleocharis obtusa*	Spike Rush	Emergent or Submerged
9	*Fimbristylis vahlii*	NONE	Emergent
10	*Hibiscus militaris*	Halberd-leaved Marsh Mallow	Emergent
11	*Hibiscus moscheutos*	Rose Mallow	Emergent
12	*Hypericum* sp.	St. John's Wort	Emergent
13	*Juncus effusus*	Rush	Emergent
14	*Justicia americana*	Water Willow	Emergent-Floating
15	*Lindernia anagallidia*	NONE	Emergent
16	*Ludwigia peploides*	Water Primrose	Emergent-Floating
17	*Onoclea sensibilis*	Sensitive Fern	Emergent
18	*Panicum agrostoides*	NONE	Emergent
19	*Panicum hemitomum*	NONE	Emergent
20	*Polygonum punctatum*	Knotweed	Emergent
21	*Sagittaria graminea*	NONE	Emergent
22	*Sagittaria latifolia*	Arrowhead	Emergent
23	*Scirpus cyperinius*	Bullrush	Emergent
24	*Taxodium distichum*	Bald Cypress	Emergent
25	*Typha latifolia*	Cattail	Emergent
26	*Zizanopsis miliacea*	Giant Cutgrass	Emergent
27	Unidentified	-----	Emergent

* refers to the listing in Table Q-2 under others.
** parasitic on Water Willow

TABLE Q-2. Locations of Aquatic Macrophytes Observed Between R-1 and R-9 (Warrior Lake), Middle Black Warrior and Tombigbee Rivers, September, 1978.

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	OTHERS
318.8	L	Patch	Giant Cutgrass	18,8,7,13,15,12
(295.3)	(L)	Creek	Alligator Weed	27,14,10
293.1	R	upriver side of creek mouth	Bullrush	9,2,18,1
(290.2)	(L)	Phillips Creek	Alligator Weed	26,23,14,10
284.2	L	Small slough	Alligator Weed	26,3,22
(283.8)	(R)	Old river bed	Alligator Weed	26,3,22,14,10
(283.3)	(L)	Sims Creek	Alligator Weed	26,3,22
(282.0)	(L)	Spencer Creek	Alligator Weed	26,3,22,9,20
(279.9)	(R)	Big slough above Five-Mile Creek	Giant Cutgrass	22,14,1,27,6,24,3
(279.5)	(R)	Five-Mile Creek	Giant Cutgrass	23,22,14,1,27,6,24,3
276.3-276.2	L	Slough	Alligator Weed	26,22,14
270.7	L	Strip	Alligator Weed	25,19,14,22,21,16
(269.5)	(L)	Minters Creek	Alligator Weed	26,21,22,23,11
267.7	L	Slough at Finch's Fy.	Alligator Weed	14,16,26,25,22,21,4
266.8	R	Strip, R-7	Giant Cutgrass	22,14
(266.5)	(R)	Big Brush Creek	Alligator Weed	14,22,26,27,23,11
(266.0)	(L)	Big slough	Alligator Weed	26,14,22,25,16,21,27,6,17,4,5
(265.8)	(R)	Big slough	Giant Cutgrass	1,14
265.3	L	Patch	Giant Cutgrass	14
(265.0)	(L)	Big slough, shores	Alligator Weed	14,6
(265.0)	(L)	Big slough, shallows	Bald Cypress	---
(264.6)	(R)	Big slough, R-8	Water Willow	6,1,16,22,25
264.3	L	Strip	Giant Cutgrass	1
(263.7)	(R)	Bank of creek	Cattail	26,23,1,14,6,4
(262.6)	(R)	Bee Branch	Water Willow	6,25,26,22,17,3,1,16,21,5
n/a	L	Slough just above dam	Giant Cutgrass	14,6,1

TABLE Q-3. Alphabetical Listing of Aquatic Macrophytes Observed Between R-10 and R-16 (Lower Black Warrior River), Middle Black Warrior and Tombigbee Rivers, September, 1978.

NUMBER*	SCIENTIFIC NAME	COMMON NAME	HABIT
1	*Alternanthera philoxeroides*	Alligator Weed	Emergent-Floating
2	*Ammannia coccinea*	NONE	Emergent
3	*Bacopa repens*	NONE	Emergent or Submerged
4	*Boehmeria cylindrica*	False Nettle	Emergent
5	*Cyperus erythrorhizos*	Sedge	Emergent
6	*Cyperus strigosus*	Sedge	Emergent
7	*Echinochloa crusgalli*	Barnyard Grass	Emergent
8	*Eclipta alba*	NONE	Emergent
9	*Eragrostis glomerata*	NONE	Emergent
10	*Eragrostis hypnoides*	NONE	Emergent or Submerged
11	*Erianthus strictus*	Narrow Plume Grass	Emergent
12	*Fimbristylis miliacea*	NONE	Emergent
13	*Fimbristylis vahlii*	NONE	Emergent
14	*Glottidium vesicarium*	NONE	Emergent
15	*Heteranthera reniformis*	NONE	Emergent or Submerged
16	*Hibiscus militaris*	Halberd-leaved Marsh Mallow	Emergent
17	*Hydrolea quadrivalvis*	Waterleaf	Emergent-Floating
18	*Justicia americana*	Water Willow	Emergent-Floating
19	*Leersia oryzoides*	Cutgrass	Emergent
20	*Lindernia anagallidia*	NONE	Emergent
21	*Ludwigia decurrens*	NONE	Emergent
22	*Ludwigia leptocarpa*	NONE	Emergent
23	*Ludwigia palustris*	NONE	Emergent or Submerged
24	*Ludwigia* sp.	NONE	Emergent
25	*Panicum agrostoides*	NONE	Emergent
26	*Panicum dichotomiflorum*	NONE	Emergent
27	*Pluchea camphorata*	Marsh Fleabane	Emergent
28	*Polygonum punctatum*	Knotweed	Emergent
29	*Sagittaria graminea*	NONE	Emergent
30	*Sagittaria latifolia*	Arrowhead	Emergent
31	*Sesbania exaltata*	Hemp Sesbania	Emergent
32	*Sphenoclea zeylandica*	NONE	Emergent
33	*Taxodium distichum*	Bald Cypress	Emergent
34	*Zizanopsis miliacea*	Giant Cutgrass	Emergent
35	Unidentified	-----	Emergent

* refers to listing in Table Q-4 under others

TABLE Q-3. continued

"Association A" is given for many localities in Table 4. This association consists of the following plants:

Barnyard Grass
Eragrostis glomerata
Eragrostis hyproides
Ammonnia coccinea
Finbristylis vahlii
Ludwigia decurrens
Lindernia anagallidia
Panicum agrostoides
Panicum dishotomiflorum
Marsh Fleabane
Cyperus erythrorhizos
Cyprus strigasus
Cutgrass (*Leersia*)

Although these plants are listed in estimated order of abundance, the estimation is pure guesswork as all these plants are close to being equal in abundance. There is no most abundant species in Association A, though Alligator Weed and especially Giant Cutgrass are often present as most abundant species.

TABLE Q-4. Locations of Aquatic Macrophytes Observed Between R-12 and R-16 (Lower Black Warrior River), Middle Black Warrior and Tombigbee Rivers, September, 1978

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	PLANTS OTHERS
(244.2)	(R)	Limestone Creek	Giant Cutgrass	10,25,26,7,27,9,17,23, 30, 21,15,25,16,6,31
244.2				
243.6	R	Strip	Giant Cutgrass	----
243.5	R	Patch	Water Willow	----
243.0	L	Strip	*Panicum agrostoides*	9,12,11,6,13,20
242.2-241.1	L	Discontinuous strips & patches	Giant Cutgrass	----
241.0	L	Patch	*Sphenoclea zeylandica*	7,26,9,27,21
(240.0)	(L)	Slough	NONE	13,9,8,21,22,25,27,32,10,2, 13,23,29,20,1,34,2,33,28,4
240.3	L	Strip	*Sphenoclea zaylandica*	7,26,9,27
240.1	R	Strip	Marsh Fleabane	7,9
239.8	L	Strip	*Panicum dichotomiflorum*	19,7,9,27,32,10,34,13
(239.4)	(R)	Slough	*Panicum dichotomiflorum*	19,9,7,10,27,5,6,1,20,2, 13,29,30
238.9	L	Patch	NONE	Association A
238.3	R	Strip	NONE	Association A
237.8	R	Strip	NONE	Association A
237.3	R	Strip	NONE	Association A
237.1	L	Strip	NONE	Association A
(235.6)	(R)	Slough	NONE	Association A
(235.3)	(R)	Slough	NONE	Association A
(235.0)	(R)	Slough	Alligator Weed	Association A + 18,11,31,3
(234.7)	(R)	Small slough	NONE	Association A + 3,32,21
234.5-234.0	R	Strips	Giant Cutgrass	Association A
(233.8)	(R)	Slough	Alligator Weed	Association A

TABLE Q-4. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	PLANTS OTHERS
233.8-232.6	L	Strip	Giant Cutgrass	Association A
233.4	R		NONE	Association A
(233.2)	(R)		Giant Cutgrass	Association A + 1,16
233.0	R		Alligator Weed	Association A
232.9-232.5	R		Giant Cutgrass	Association A
(232.5)	(R)	Left bank of creek	Water Willow	Association A
232.4	R	Strip	Giant Cutgrass	----
231.9	R	Patch	Giant Cutgrass	----
231.8	L	Patch	Giant Cutgrass	----
(231.7)	(L)	Slough	Giant Cutgrass	Association A
231.5	L	Mouth of slough	Giant Cutgrass	Association A
(231.0)	(R)	Big Prairie Creek	Alligator Weed	Association A + 18,16,3
230.9-230.9	R	Strip	Giant Cutgrass	Association A
230.2	L	Strip	Giant Cutgrass	Association A
(239.6)	R	Slough	Alligator Weed	Association A + 34,18,24
229.7	R	Strip	Giant Cutgrass	----
229.3	L	Patch	Giant Cutgrass	----
229.2	L	Patch	Giant Cutgrass	Association A
228.9	L	Slough	Giant Cutgrass	----
(228.7)	L	Small slough	Giant Cutgrass	----
(228.6)	R	Slough	Giant Cutgrass	32,1
228.4	L	Slough at APCO canal	NONE	Association A + 32
228.2	L	Strip	Giant Cutgrass	Association A
228.1	R	Strip	Gianc Cutgrass	Association A
228.0-225.7	L	Strip	Giant Cutgrass	Association A
227.8-227.1	R	Strip	Giant Cutgrass	Association A
(227.1)	(R)	Slough	Alligator Weed	18
227.0-226.6	R		Giant Cutgrass	Association A

TABLE Q-4. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS: MOST ABUNDANT	PLANTS: OTHERS
(226.3)	(R)	Yellow Creek	Alligator Weed	Association A + 18,34
225.6	R	Strip	Giant Cutgrass	Association A
225.5	L	Mouth of Backbone Creek	Giant Cutgrass	Association A +31
225.4-224.8	R	Strip & up slough	Giant Cutgrass	Association A + 1,16
224.8-223.8	R	Strip	Giant Cutgrass	Association A
224.7-221.9	L	Strip	Giant Cutgrass	Association A
(223.5)	(R)	Slough	Giant Cutgrass	Association A + 18
223.3	R	Strip	Water Willow	----
223.0	R	Patch	Giant Cutgrass	Association A
(222.7)	(R)	French Creek	Water Willow	Association A +34,31,5,6
222.7-222.1	R	Strip, island slough	Giant Cutgrass	Association A
(221.8)	(R)	Slough at RR bridge	Giant Cutgrass	Association A + 18,1,16
(221.5)	(R)	Small slough	Giant Cutgrass	Association A + 29
(221.0)	(L)	Slough	Giant Cutgrass	Association A + 18
(221.0)	(R)	Small slough	Giant Cutgrass	Association A + 18
220.8	R	Strip	Giant Cutgrass	Association A
(220.8)	(L)	Small slough	Giant Cutgrass	Association A + 1,18
220.5-220.1	L	Strip	Giant Cutgrass	Association A
220.2	R	Strip	Giant Cutgrass	Association A
219.8	R	Strip	Giant Cutgrass	Association A
219.6	L	Strip	Giant Cutgrass	Association A
219.5-219.0	R	Strip	Giant Cutgrass	Association A
(219.2)	(L)	Kelley-Williams Creek	Giant Cutgrass	Association A + 29,18
(219.0)	(R)	Slough at US-43	Allig[illegible]	Association A + 34,18
219.0-218.4	L	Strip	Giant [illegible]grass	Association A + 18
218.9-218.3	R	Strip	Giant Cutgrass	Association A
218.3-217.3	L	Strip	Giant Cutgrass	Association A

TABLE Q-4. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	PLANTS OTHERS
218.0-217.2	R	Strip	Giant Cutgrass	Association A
(217.1)	(L)	Slough	Giant Cutgrass	1,18,20,32,5,6

TABLE Q-5. Alphabetical Listing of Aquatic Macrophytes Observed Between R-17 and R-23 (Tombigbee River and Demopolis Lake), Middle Black Warrior and Tombigbee Rivers, September, 1978.

NUMBER *	SCIENTIFIC NAME	COMMON NAME	HABIT
1	*Alternanthera philoxeroides*	Alligator Weed	Emergent-Floating
2	*Ammannia coccinea*	NONE	Emergent
3	*Bacopa repens*	NONE	Emergent or Submerged
4	*Boehmeria cylindrica*	False Nettle	Emergent
5	*Cardiospermum halicacabum*	Balloon Vine	Emergent
6	*Commelina communis*	Day Flower	Emergent
7	*Cyperus erythrorhizos*	Sedge	Emergent
8	*Cyperus strigosus*	Sedge	Emergent
9	*Echinochloa crusgalli*	Barnyard Grass	Emergent
10	*Eclipta alba*	NONE	Emergent
11	*Eleocharis obtusa*	Spike Rush	Emergent or Submerged
12	*Eragrostis glomerata*	NONE	Emergent
13	*Eragrostis hypnoides*	NONE	Emergent
14	*Fimbristylis miliacea*	NONE	Emergent
15	*Fimbristylis vahlii*	NONE	Emergent
16	*Glottidium vesicarium*	NONE	Emergent
17	*Heliotropium indicum*	Heliotrope	Emergent
18	*Hibiscus militaris*	Halberd-leaved Marsh Mallow	Emergent
19	*Hydrocotyle verticillata*	Penny Wort	Emergent or Submerged
20	*Hypericum walteri*	St. John's Wort	Emergent
21	*Ipomea lacunosa*	Morning Glory	Emergent
22	*Justicia americana*	Water Willow	Emergent-Floating
23	*Leersia oryzoides*	Cutgrass	Emergent
24	*Lindernia anagallidia*	NONE	Emergent
25	*Lindernia dubia*	NONE	Emergent
26	*Lippia lanceolata*	NONE	Emergent
27	*Ludwigia decurrens*	NONE	Emergent
23	*Ludwigia leptocarpa*	NONE	Emergent
29	*Ludwigia* sp.	NONE	Emergent
30	*Mikania scandens*	Climbing Hempweed	Emergent
31	*Panicum agrostoides*	NONE	Emergent
32	*Panicum dichotomiflorum*	NONE	Emergent
33	*Pluchea camphorata*	Marsh Fleabane	Emergent
34	*Polygonium lapathifolium*	Knotweed	Emergent
35	*Polygonum pennsylvanicum*	Knotweed	Emergent

* refers to listing in Table Q-6 under others

TABLE Q-5. continued

NUMBER	SCIENTIFIC NAME	COMMON NAME	HABIT
36	*Polygonum punctatum*	Knotweed	Emergent
37	*Sagittaria graminea*	NONE	Emergent
38	*Sagittaria latifolia*	Arrowhead	Emergent
39	*Sagittaria montevidiensis*	Arrowhead	Emergent
40	*Sesbania exaltata*	Hemp Sesbonia	Emergent
41	*Sphenoclea zeylandica*	NONE	Emergent
42	*Spirodelia oligorrhiza*	Duck Weed	Floating
43	*Taxadium distichum*	Bald Cypress	Emergent
44	*Typha latifolia*	Cattail	Emergent
45	*Xanthium strumarium*	Cocklebur	Emergent
46	*Zizanopsis miliacea*	Giant Cutgrass	Emergent
47	Unidentified, *Brassicaceae*	---- (Mustard Family)	Emergent
48	Unidentified	----	Emergent

TABLE Q-5. continued

"Association B" is given for several localities in Table 6. The plants present in this association are as follows:

Lindernia anagallidia
Lindernia dubia
Eragrostis hyproides
Cyperus erythrorhizos
Cyperus strigosus
Sagittaria latifolia
Eragrosts glomerata
Barnyard grass
Bacopa repens
Sesbania exaltata

Again, this order of abundance is not necessarily true for all localities.

TABLE Q-6. Locations of Aquatic Macrophytes Observed Between R-17 and R-23 (Tombigbee River and Demopolis Lake), Middle Black Warrior and Tombigbee River, September, 1978

RIVER MILE	BANK	DESCRIPTION	PLANTS: MOST ABUNDANT	PLANTS: OTHERS
278.5	L	Cliff bases	Water Willow	---
274.8	R	Cliff bases	Water Willow	---
(273.5)	(R)	Tubb Creek	*Hibiscus militaris*	---
279-260	L&R	Various small patches	Bald Cypress	---
246.8	L	Patch	Water Willow	---
232.9	R	Strip	*Panicum dichotomiflorum*	12,33
232.3	R	Strip	*Hibiscus militaris*	12,4
232.2	L	Strip	Marsh Fleabane	45
231.5	R	Strip	Marsh Fleabane	45
(231.3)	(R)	McConnico Creek	Water Willow	18,11,37,32,2,36,24,7,8,14
231.1-230.2	L&R	Strips	Marsh Fleabane	18,12,32
(229.4)	(R)	Slough	Marsh Fleabane	7,8,12,22,32,18,43
(229.4)	(L)	Slough	Marsh Fleabane	7,8,12,22,32,18,43
(228.3)	(R)	Slough in Co-op canal	Water Willow	16,3,32,7,2,33,6,5,16 19,47,40,36
228.1	R	Small slough	*Ludwigia* sp.	15,45,9,17,43
(228.0)	(R)	Large sloughs	Water Willow	---
227.3	L	Strip	Water Willow	---
227.0	R	Strip	Water Willow	---
225.7	L	Patch	Hemp Sesbania	---
224.8	R	Patch	*Fimbristylis miliacea*	17,45
224.0	R	Patch	Hemp Sesbania	33
223.8	L	Strip	Water Willow	7,8
223.1	L	On point at confluence of river and cut-off canal	*Sagittaria montevidiensis*	2,1
223.1	R	Patch	Alligator Weed	---
(222.7)	(L)	Creek at D-5	Water Willow	23,12,32
222.2	R	Patch	Hemp Sesbania	---
221.9	L	Strip	NONE	Association B
221.7	R	Strip	*Eragrostis glomerata*	22
221.3	R	Patch	Water Willow	---
221.0	L	Patch	*Eragrostis glomerata*	24,33,12,15,28,47
221.0	R	Creek	Water Willow	
220.8	R	Patch	NONE	Association B

TABLE Q-6. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	PLANTS OTHERS
220.6	R	Slough	NONE	Association B
220.4	R	Strip	NONE	Association B
219.9	R	Patch	NONE	Association B
(219.2)	(L)	Large slough	Water Willow	48,20,32,31
(219.0)	(L)	Slough, Belmont public use Area	Bald Cypress	22,37,18,33
219.8	L	Strip	Water Willow	45,13,46
217.8	L	Patch	Water Willow	45,7,8,27,28,12
(216.9)	(R)	Creek	Alligator Weed	22
216.8-216.1	R	Strip	Barnyard Grass	22,1,46,33
(216.0)	([illegible])	Creek at US-43	Alligator Weed	38,9,18,40,32,23,7,8,43,16
216.3-214.7	L	Strip	Barnyard Grass	22,46
(215.4)	(R)	Slough	Alligator Weed	22,46,24,2,15,7,8,45,17 21,33,27,9,4,34,18,42,35 10,31,38,39,37,13,36,41
(215.1)	(R)	Creek	Giant Cutgrass	22,45,37,10,21,27,37,13 33,23,12,32,41,7,8
214.9	R	Near barge docks	Giant Cutgrass	22
214.7	R	Patch	Water Willow	23,18
214.5	R	Patch	Alligator Weed	---
214.3	R	Patch	Barnyard Grass	18
214.2	R	Foscue Creek mouth, upriver side	NONE	32,23,7,8,18,2,1,24,27,22
(214.2)	R	Up Foscue Creek	Alligator Weed	18,22,9,6
214.6-214.0	L	Strips & sloughs	Alligator Weed	22,46,9
(214.0)	(R)	Up creek, near CG station	Water Willow	23,9
213.9-213.4	L	Strips & sloughs	Alligator Weed	22,36,30

TABLE Q-7. Alphabetical Listing of Aquatic Macrophytes Observed Between R-1 and R-9 (Warrior Lake), Middle Black Warrior and Tombigbee River, August, 1979.

NUMBER*	SCIENTIFIC NAME	COMMON NAME	HABIT
	Alnus serrulata	Alder	Emergent
2	*Alternanthera philoxeroides*	Alligator Weed	Emergent-Floating
3	*Ammannia coccinea*	NONE	Emergent
4	*Arundinaria gigantea*	Cane	Emergent
5	*Boehmeria cylindrica*	False Nettle	Emergent
6	*Cephalanthus occidentalis*	Button Bush	Emergent
7	*Cyperus erythrorhizos*	Sedge	Emergent
8	*Cyperus iria*	Sedge	Emergent
9	*Cyperus polystachyos*	Sedge	Emergent
10	*Cyperus pseudovegetas*	Sedge	Emergent
11	*Cyperus strigosus*	Sedge	Emergent
12	*Echinochloa crusgalli*	Barnyard Grass	Emergent
13	*Eclipta alba*	NONE	Emergent
14	*Eleocharis obtusa*	Spike Rush	Emergent or Submerged
15	*Eragrostis glomerata*	NONE	Emergent
16	*Erianthus giganteus*	Giant Plumegrass	Emergent
17	*Fimbristylis autumnalis*	NONE	Emergent
18	*Fimbristylis miliacea*	NONE	Emergent
19	*Fimbristylis vahlii*	NONE	Emergent
20	*Hibiscus militaris*	Halberd-Leaved Marsh Mallow	Emergent
21	*Hibiscus moscheutos*	Rose Mallow	Emergent
22	*Hypericum* sp.	St. John's Wort	Emergent
23	*Justicia americana*	Water Willow	Emergent-Floating
24	*Juncus effusus*	Rush	Emergent
25	*Lindernia anagallidia*	NONE	Emergent
26	*Lobelia cardinalis*	Cardinal Flower	Emergent
27	*Ludwigia decurrens*	NONE	Emergent
28	*Ludwigia palustris*	NONE	Emergent
29	*Ludwigia peploides*	Water Primrose	Emergent-Floating
30	*Onoclea sensibilis*	Sensitive Fern	Emergent
31	*Panicum agrostoides*	NONE	Emergent
32	*Panicum dichotomiflorum*	NONE	Emergent
33	*Panicum hemitomum*	NONE	Emergent
34	*Paspalum* sp.	---	Emergent
35	*Pluchea camphorata*	Marsh Fleabane	Emergent
36	*Rhexia virginica*	Meadow Beauty	Emergent

* refers to listing in Table O-8 under others

TABLE Q-7. continued

NUMBER	SCIENTIFIC NAME	COMMON NAME	HABIT
37	*Rhynchospora corniculata*	Beak Rush	Emergent
38	*Sagittaria graminea*	NONE	Emergent
39	*Sagittaria latifolia*	Arrowhead	Emergent
40	*Salix nigra*	Willow	Emergent
41	*Saururus cernuus*	Lizard's Tail	Emergent
42	*Scirpus americanus*	NONE	Emergent
43	*Scirpus cyperinius*	Bullrush	Emergent
44	*Sesbania exaltata*	Hemp Sesbania	Emergent
45	*Sphenoclea zeylandica*	NONE	Emergent
46	*Taxodium distichum*	Bald Cypress	Emergent
47	*Tripsacum dactyloides*	Gamma Grass	Emergent
48	*Typha latifolia*	Cattail	Emergent
49	*Xanthium strumarium*	Cocklebur	Emergent
50	*Zizanopsis miliacea*	Giant Cutgrass	Emergent

TABLE Q-7. continued

Associations listed in Table 8.

<u>Association I:</u>

Panicum agrostoides (most abundant sp.)
Panicum dichotomiflorum
Ludwigia decurrens
Halberd-Leaved Marshmallow
Rose Mallow
Panicum hemitomum
Lindernia anagallidia

<u>Association II:</u>

Alligator Weed (most abundant)
Giant Cutgrass
Arrowhead
Sagittaria graminea
Water Willow
Gamma Grass
Bullrush
Halberd-Leaved Marsh Mallow

TABLE Q-8. Locations of Aquatic Macrophytes Observed Between R-1 and R-9 (Warrior Lake), Middle Black Warrior and Tombigbee River, August, 1979

RIVER MILE	BANK	DESCRIPTION	PLANTS: MOST ABUNDANT	%	OTHER
338.0	R	Large patch	*Scirpus americanus*	70	31,50,25,44,27,32
338.0- ca 334	L	Broken strips & patches	*Panicum agrostoides*	50	Association I
337.8- ca 334	R	Broken strips & patches	*Panicum agrostoides*	50	Association I
334.0	L	Strip	*Panicum agrostoides*	50	Association I
333.4	R	Strip	*Panicum agrostoides*	50	Association I
332.0	L	Patch	*Panicum hemitomum*	100	
331.2	L	Patch	*Panicum agrostoides*	50	Association I
330.5	R	Patch	*Panicum agrostoides*		Association I
329.5	R	Patch	*Panicum agrostoides*		Association I
327.3	L	Strip	*Panicum agrostoides*		Association I
324.6	R	Strip	*Panicum agrostoides*		Association I
323.7	R	Strip	*Panicum agrostoides*		Association I
323.5	L	Strip	*Panicum agrostoides*		Association I
321.2	R	Strip	*Panicum agrostoides*		Association I
320.7	R	Strip	*Panicum agrostoides*		Association I
320.2	L	Patch	*Panicum agrostoides*		Association I
320.0	R	Strip	*Panicum agrostoides*		Association I
315.5	L	Strip	*Panicum agrostoides*		Association I
314.4	L	Strip	*Panicum agrostoides*		Association I
314.1- 313.8	R	Strip	*Panicum agrostoides*	80	Association I
312.4	R	Mouth of creek	*Panicum agrostoides*	50	Association I
310.7	L	Strip	*Panicum agrostoides*	50	Association I
309.9	L	Strip	*Panicum agrostoides*	50	Association I
303.0	L	Patch	*Panicum agrostoides*	50	Association I
302.8	L	Patch	*Panicum agrostoides*	50	Association I
301.7	L	Patch	Giant Cutgrass	100	
299.1	L	Patch	*Panicum agrostoides*	50	25,32,20,27,50,21,33
298.7- 298.4	R	Strip	*Panicum agrostoides*	50	Association I
296.6	L	Patch	*Panicum agrostoides*	50	25,32,20,27,50,21,33
295.5	L	Upriver side of creek mouth	NONE	--	40,29,50,18,17,3,27,15,7 44,10,11,28,14,43,35,13,8
(295.4)	L	Ca. 100 yds up creek	Alligator Weed	60	50,23

TABLE Q-8. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS: MOST ABUNDANT	%	OTHER
295.3	L	Downriver side of creek mouth	NONE	--	Same as Locality #30
295.2	L	Brook, just below creek mouth	*Cyperus iria*	40	27,40,29,50,18,17,3,15 7,44,10,11,28,14,43,35, 13,25
295.0	L	Patch	*Panicum agrostoides*	50	Association I
293.5	R	Old Lock #9	Water Willow	40	2,43,25,31,6,5,41,47,1
291.9	L	Patch	Sensitive Fern	100	
291.1	R	Patch	*Panicum dichotomiflorum*	100	
288.3	R	Patch	*Paspalum* sp.	40	40,50,49,27,3,13,17,6,31
284.1	L	Mouth of slough	Giant Cutgrass	50	43,40,39,27
283.8	R	Entrance to old river bend	Giant Cutgrass	40	2,23,39,20,43,27,40
283.6	L	Patch in small inlet	Giant Cutgrass	40	2,23,39,20,43,27,40
283.4	L	up in slough	Giant Cutgrass	100	
283.2- 282.8	R	Bank & slough	Giant Cutgrass	80	20,40,15,2,43,23
282,0	L	Mouth of slough	Giant Cutgrass	60	31,6,21,2
282.0	L	In Slough	Alligator Weed	50	50,23,39,35,20,15
281.3- 280.8	L	Wide strip	Giant Cutgrass	100	
281.3- 280.1	R	Wide strip	Giant Cutgrass	100	
280.0	R	Strip	Giant Cutgrass	50	2,23
279.9	R	Islets	Alligator Weed	50	Association II + 44
(279.9)	(R)	Large slough above Five-Mile Creek	Giant Cutgrass	50	2,23,39,30,15,31
(279.8- 279.3)	(R)	Island & straits	Alligator Weed	50	Association II + 44
(279.5)	(R)	5-Mile Creek, left bank	Alligator Weed	50	50,23,39,4,15,40,31,49
(279.5)	(R)	5-Mile Creek, near right bank	Bald Cypress	100	
279.1	R	Downriver side of creek mouth	Alligator Weed	50	Association II
278.9	L	Shore and shallows	Giant Cutgrass	70	40
278.0	R	Sloughs and shallows	Alligator Weed	50	Association II
277.7- 277.3	L	Slough and shallows	Alligator Weed	50	Association II + 32
277.1	L	Slough	Giant Cutgrass	100	
276.8	R	Slough and shallows	Alligator Weed	50	Association II
276.6- 276.1	L	Slough and shallows	Alligator Weed	50	Association II

TABLE Q-8. *continued*

RIVER MILE	BANK	DESCRIPTION	PLANTS: MOST ABUNDANT	%	OTHER
276.0-					
275.7	R	Shores	Giant Cutgrass	100	
275.6	R	Sloughs	Giant Cutgrass	50	29,39,23,47,43,20,38,2
274.9-					
274.5	L	Slough and shallows	Alligator Weed	50	Association II + 44
274.6	R	Strip	Giant Cutgrass	60	23
274.5-					
274.1	L	Strip	Giant Cutgrass	60	43
273.8	L	Patch	*Panicum dichotomiflorum*	100	
273.5	R	Patch	Giant Cutgrass	60	43,23
273.4	L	Patch	Giant Cutgrass	60	23
273.2-					
271.2	R	Strip	Giant Cutgrass	50	2,23,43
271.1	R	Strip	Giant Cutgrass	50	2,23,43,26
270.7-					
270.3	L	Shallows around creek mouth	Alligator Weed	50	Association II
270.0-					
269.8	R	Strip	Giant Cutgrass	60	23
269.6	R	Patch	NONE	--	50,23,26,36,30,32,5,22
(269.5)	(L)	Minter's Creek	Alligator Weed	50	Association II + 46
269.4	R	Island and strait	Alligator Weed	50	Association II + 32
269.0	R	Slough	Alligator Weed	50	Association II
268.7	L	Just Below pipeline	Giant Cutgrass	100	
268.3	L	Strip	Giant Cutgrass	100	
267.7	R	Strip	Giant Cutgrass	100	
267.7	L	Slough at Finch's Ferry	Alligator Weed	40	Association II + 37,29,6 48,44,5
267.5	L	Strip	Giant Cutgrass	60	23
267.4	R	Mouth of slough	Giant Cutgrass	60	43
267.0-					
266.7	R	Slough and shore	Giant Cutgrass	60	43,23
(266.5)	(R)	Big Bush Creek	Water Willow	60	2,50,39
266.4	L	Strip	Giant Cutgrass	100	
266.2	L	Slough and shallows	Alligator Weed	50	Association II + 29
(265.8)	(R)	Slough	Alligator Weed	50	Association II
265.8	R	Islet at slough mouth	Giant Cutgrass	100	

TABLE Q-8. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	%	OTHER
265.3-					
265.0	L	Strip	Giant Cutgrass	50	23,43,44
265.0	R	Patch	Alligator Weed	50	Association II + 32
(265.0)	(L)	Shores of slough	Alligator Weed	50	Association II
(265.0)	(L)	Shallows in slough	Bald Cypress	100	
264.5	R	Sloughs and shallows	Alligator Weed	50	Association II
264.3	L	Slough	Alligator Weed	50	Association II + 29
263.8	L	Slough	Alligator Weed	50	Association II + 29
263.8-					
263.3	L	Strip	Giant Cutgrass	50	39,38,32
263.7-					
263.2	R	Strip	Alligator Weed	50	Association II
263.1-					34,15,16,12,29,32,23,3,
262.8	L	Strip and slough	Giant Cutgrass	60	19,35,7,9,24,47,31,39,45
262.6-					
261.9	R	Strip on shore & creek	Giant Cutgrass	100	
262.2	L	Strip ca ½ mile long	Giant Cutgrass	50	23,39,43
n/a	R	Strip, above dam	Water Willow	50	50,23
n/a	L	Slough, above dam	Alligator Weed	50	Association II + 29

TABLE Q-9. Alphabetical Listing of Aquatic Macrophytes Observed Between R-10 and R-16 (Lower Black Warrior River), Middle Black Warrior and Tombigbee River, August 1979.

NUMBER *	SCIENTIFIC NAME	COMMON NAME	HABIT
1	*Alternanthera philoxeroides*	Alligator Weed	Emergent-Floating
2	*Ammannia coccinea*	NONE	Emergent
3	*Bacopa repens*	NONE	Emergent or Submerged
4	*Carex joorii*	NONE	Emergent
5	*Cassia obtusifolia*	Sicklepod	Emergent
6	*Cephalanthus occidentalis*	Buttonbush	Emergent
7	*Cyperus erythrorhizos*	Sedge	Emergent
8	*Cyperus strigosus*	Sedge	Emergent
9	*Diodia virginiana*	NONE	Emergent
10	*Echinochloa crusgalli*	Barnyard Grass	Emergent
11	*Echinodorus cordifolius*	Burhead	Emergent
12	*Eclipta alba*	NONE	Emergent
13	*Eleocharis obtusa*	Spike Rush	Emergent or Submerged
14	*Eragrostis cilianensis*	NONE	Emergent
15	*Eragrostis glomerata*	NONE	Emergent
16	*Eragrostis hypnoides*	NONE	Emergent
17	*Erianthus strictus*	Narrow Plumegrass	Emergent
18	*Fimbristylis autumnalis*	NONE	Emergent
19	*Fimbristylis vahlii*	NONE	Emergent
20	*Hibiscus militaris*	Halberd-leaved Marsh Mallow	Emergent
21	*Justicia americana*	Water Willow	Emergent-Floating
22	*Lindernia anagallidia*	NONE	Emergent
23	*Lippia nodiflora*	NONE	Emergent
24	*Ludwigia decurrens*	NONE	Emergent
25	*Ludwigia* sp.	NONE	Emergent
26	*Mollugo verticillata*	Carpetweed	Emergent
27	*Onoclea sensibilis*	Sensitive Fern	Emergent
28	*Panicum agrostoides*	NONE	Emergent
29	*Panicum dichotomiflorum*	NONE	Emergent
30	*Pluchea camphorata*	Marsh Fleabane	Emergent
31	*Sabal minor*	Palmetto	Emergent
32	*Sagittaria graminea*	NONE	Emergent
33	*Sagittaria latifolia*	Arrowhead	Emergent
34	*Salix nigra*	Willow	Emergent
35	*Scirpus cyperinius*	Bullrush	Emergent

* refers to listing in Table Q-10 under others

TABLE Q-9. continued

NUMBER	SCIENTIFIC NAME	COMMON NAME	HABIT
36	*Sesbania exaltata*	Hemp Sesbania	Emergent
37	*Sphenoclea zeylandica*	NONE	Emergent
38	*Taxodium distichum*	Bald Cypress	Emergent
39	*Tripsacum dactyloides*	Gamma Grass	Emergent
40	*Xanthium strumarium*	Cocklebur	Emergent
41	*Zizanopsis miliacea*	Giant Cutgrass	Emergent
42	Unidentified, *Poaceae*	--- (Grass)	Emergent
43	Unidentified, *Rubiaceae*	--- (Madder Family)	Emergent

TABLE Q-9. continued

Associations listed in Table 10.

Association III:

Giant Cutgrass (most abundant)
Willow
Panicum dichotomiflorum
Eragrostis glomerata
Cocklebur
Panicum agrostoides
Water Willow
Alligator Weed

Association IV:

Alligator Weed (most abundant
Water Willow
Giant Cutgrass
Buttonbush
Halberd-Leaved Marsh Mallow
Willow
Cocklebur
Gamma Grass

TABLE Q-10. Locations of Aquatic Macrophytes Observed Between R-10 and R-16 (Lower Black Warrior River), Middle Black Warrior and Tombigbee Rivers, August 1979

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	%	OTHER
n/a	L	Slough, just below Warrior Dam	Alligator Weed	40	41,28,20,34,9,30,36,40 15,23,43
n/a	R	Strip in bend above lock entrance	Water Willow	50	28,29,11,1
260.5	R	Patch	Arrowhead	40	28,9,6,30,13,35
259.9	R	Patch	Arrowhead	40	28,9,6,30,13,35
257.3	L	Patch	Giant Cutgrass	60	21
255.5	L	Small slough	Giant Cutgrass	60	5,15,16,38,12,30,35
254.0	L	Patch	Arrowhead	40	28,9,6,30,13,35
252.0	L	Patch	Willow	50	28,19,15,41,33
251.1	R	Shore and slough	Giant Cutgrass	50	20,15,1,24,28,30,10
249.2	L	Slough	Giant Cutgrass	50	20,15,1,24,28,30,10
248.6	R	Strip	Giant Cutgrass	60	Association III
248.4	L	Slough	Giant Cutgrass	50	10,40,37,1,15,24,29,34, 36,33,28,18
248.0	R	Several small patches	Giant Cutgrass	60	Association III
247.5	L	Strip	Giant Cutgrass	60	Association III
247.3-246.7	L	Strip	Giant Cutgrass	60	Association III
246.8	R	Strip	Giant Cutgrass	60	Association III
246.0	R	Strip	Giant Cutgrass	60	Association III
245.8	L	Strip	Giant Cutgrass	60	Association III
245.6	R	Strip	Giant Cutgrass	60	Association III
244.2	R	Upriver side of creek mouth	NONE	--	10,41,15,1,19,12,16,24,14
244.1-243.4	R	Strip	Giant Cutgrass	60	21,29
241.9	L	Patch	Giant Cutgrass	100	
241.5-241.2	L	Strip	Giant Cutgrass	80	9
240.9-240.9	L	Slough	Alligator Weed	70	20,41,28
240.5	L	Strip	Giant Cutgrass	50	Association III
240.0-239.8	L	Strip	Giant Cutgrass	50	Association III
239.2	R	Small slough	NONE	--	29,15,20,1,41,24,16,19,22, 36,12,9,2[illegible],37,30,26

TABLE Q-10. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	%	OTHER
238.6	L	Strip	Giant Cutgrass	60	Association III
237.2	L	Small slough	Giant Cutgrass	60	Association III
235.6	R	Slough	Alligator Weed	80	Association IV
235.3	R	Slough	Alligator Weed	80	Association IV
235.0	R	Slough	Alligator Weed	80	Association IV
234.5	R	Strip	Giant Cutgrass	60	Association IV
234.2-233.8	R	Strip	Giant Cutgrass	60	Association IV
234.0	L	Strip	Giant Cutgrass	60	Association IV
233.8	L	Strip	Giant Cutgrass	60	Association IV
233.7	R	Strip & small slough	Giant Cutgrass	60	Association IV
233.7-232.5	L	Strip	Giant Cutgrass	60	Association IV
233.2-232.5	R	Strip	Giant Cutgrass	60	Association IV
(232.5)	(R)	Left bank of creek	Alligator Weed	50	Association IV + 37,36 24,10,7
232.4	R		Alligator Weed	80	Association IV
232.0	L	Strip	Giant Cutgrass	60	Association III
232.0					
231.7	R	Strip	Giant Cutgrass	60	Association III
231.7	L	Upriver side of slough mouth	Giant Cutgrass	60	Association III
(231.7)	(L)	Shallows in Slough	Bald Cypress	100	
231.7-230.5	L	Downriver from slough	Giant Cutgrass	60	Association III
231.2	R	Strip	Giant Cutgrass	60	Association III
231.1-230.5	L	Strip	Giant Cutgrass	60	Association III
(231.0)	R	Big Prairie Creek	Alligator Weed	60	Association IV + 31,28,6
231.0	R	Downriver side of creek mouth	Giant Cutgrass	60	Association III
230.7	R	Slough	Alligator Weed	80	Association IV
230.3-230.0	L	Strip	Giant Cutgrass	60	Association III
299.2	R	Strip	Giant Cutgrass	60	Association III
228.8	L	Strip	Giant Cutgrass	60	Association III
(228.7)	(L)	Back of slough	Alligator Weed	100	

TABLE Q-10. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS: MOST ABUNDANT	%	OTHER
228.7-228.5	L	Strip	Giant Cutgrass	60	Association III
228.4	L	Point at upriver side of entrance to APCO canal	Alligator Weed	70	41,22,15,40,2,30,24,37, 10,20,34,28,36,3
228.1	L	Patches & strips	Giant Cutgrass	60	Association III
227.9	L	Patches	Giant Cutgrass	60	Association III
227.7-227.3	L	Strip	Giant Cutgrass	60	Association III
227.2	R	Strip	Giant Cutgrass	60	Association III
227.1-226.3	L	Strip	Giant Cutgrass	60	Association III
227.0	R	Small slough	Giant Cutgrass	60	Association III
226.8	R	Strip	Giant Cutgrass	60	Association III
(226.2)	(R)	Yellow Creek	Alligator Weed	50	21,41,20,31,39,6
225.5	L	Mouth of Backbone Creek	Giant Cutgrass	60	Association III
225.2	R	Strip	Giant Cutgrass	60	Association III
224.9	L	Strip	Giant Cutgrass	60	Association III
224.9	R	Mouth of slough	Giant Cutgrass	60	Association III
224.8-222.0	L	Strip	Giant Cutgrass	60	Association III
224.7	R	Strip	Giant Cutgrass	60	Association III
224.2-223.9	R	Strip	Giant Cutgrass	60	Association III
223.4	R	Strip	Giant Cutgrass	60	Association III
(222.8)	(R)	French Creek, left bank at mouth	*Fimbristylis autumnalis*	70	1,41,30,24,33,8,20,21,23,2
(222.8)	(R)	French Creek, islets near left Bank	Water Willow	100	
(222.8)	(R)	French Creek, under highway bridge	Water Willow	100	
(222.8)	(R)	French Creek, right bank, 1/2 mile in	Water Willow	100	
(222.8)	(R)	French Creek, right bank at mouth	Alligator Weed	70	21,41,32
222.4-222.2	R	Island and Straits	Alligator Weed	80	Association IV

TABLE Q-10. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	%	OTHER
(222.1)	(R)	Strip in Slough	Giant Cutgrass	60	Association III
(221.8)	(R)	Slough Behind RR bridge	Alligator Weed	80	Association IV + 15
221.4	R	Small slough	Alligator Weed	80	Association IV
221.3	R	Strip	Giant Cutgrass	60	Association III
221.2-221.0	L	Strip	Giant Cutgrass	60	Association III
221.0	R	Slough	Alligator Weed	80	Association IV
220.8	L	Small slough	Giant Cutgrass	60	Association III
220.8	R	Strip	Giant Cutgrass	60	Association III
220.6-220.1	L	Slough	Alligator Weed	80	Association IV
220.2	R	Strip	Giant Cutgrass	60	Association III
219.9	R	Patch	Giant Cutgrass	60	15,29
219.7	R	Patch	Giant Cutgrass	60	Association III
219.5	R	Strip	Giant Cutgrass	60	Association III
219.3-219.0	R	Strip	Giant Cutgrass	60	Association III
219.2	L	Strip at creek mouth	Giant Cutgrass	60	Association III + 39
219.0	R	Slough	Alligator Weed	80	Association IV
218.9-218.5	L	Strip	Giant Cutgrass	60	Association III
218.7	R	Strip	Giant Cutgrass	60	Association III
(218.5)	(L)	Runaway Branch, discontinuous patches	Alligator Weed	60	41,21,6,28,20,29,15, 17,38,42,36,30,32,4
218.0-217.4	L	Strip	Giant Cutgrass	90	20,41
218.0-217.1	R	Strip	Giant Cutgrass	60	Association III
217.1	L	Slough	Alligator Weed	50	21,41,33,34,6,28,11,42,20

TABLE Q-11. Alphabetical Listing of Aquatic Macrophytes Observed Between R-17 and R-23 (Tombigbee River and Demopolis Lake), Middle Black Warrior and Tombigbee Rivers, August 1979

NUMBER*	SCIENTIFIC NAME	COMMON NAME	HABIT
1	*Alternanthera philoxeroides*	Alligator Weed	Emergent-Floating
2	*Ammannia coccinea*	NONE	Emergent
3	*Boehmeria cylindrica*	False Nettle	Emergent
4	*Cassia obtusifolia*	Sicklepod	Emergent
5	*Cephalanthus occidentalis*	Buttonbush	Emergent
6	*Cyperus articulatus*	Sedge	Emergent
7	*Cyperus erythrorhizos*	Sedge	Emergent
8	*Cyperus odoratus*	Sedge	Emergent
9	*Datura stramonium*	Jimson Weed	Emergent
10	*Digitaria sanguinalis*	Crab Grass	Emergent
11	*Echinochloa crusgalli*	Barnyard Grass	Emergent
12	*Eclipta alba*	NONE	Emergent
13	*Eleocharis obtusa*	Spike Rush	Emergent or Submergent
14	*Erogrstis cilianensis*	NONE	Emergent
15	*Erogrostis glomerata*	NONE	Emergent
16	*Erogrostis hypnoides*	NONE	Emergent
17	*Fimbristylis autumnalis*	NONE	Emergent
18	*Finbristylis miliacea*	NONE	Emergent
19	*Firbristylis vahlii*	NONE	Emergent
20	*Hibiscus militaris*	Halberd-Leaved Marsh Mallow	Emergent
21	*Hibiscus moscheutos*	Rose Mallow	Emergent
22	*Itea virginica*	Virginia Willow	Emergent
23	*Justicia americana*	Water Willow	Emergent-Floating
24	*Leersia oryzoides*	Cutgrass	Emergent
25	*Lindernia anagallidia*	NONE	Emergent
26	*Lippia nodiflora*	NONE	Emergent
27	*Ludwigia decurrens*	NONE	Emergent
28	*Ludwigia peploides*	Water Primrose	Emergent-Floating
29	*Onoclea sensibilis*	Sensitive Fern	Emergent
30	*Panicum agrostoides*	NONE	Emergent
31	*Panicum dichotomiflorum*	NONE	Emergent
32	*Platanus occidentalis*	Sycamore	Emergent
33	*Pluchea camphorata*	Marsh Fleabane	Emergent
34	*Polygonum pennsylvanicum*	Knotweed	Emergent
35	*Rorippa sessiliflora*	Yellow Cress	Emergent or Submergent

* refers to numbers in Table Q-12 under others

TABLE Q-11. continued

NUMBER	SCIENTIFIC NAME	COMMON NAME	HABIT
36	*Sagittaria montevidiensis*	Arrowhead	Emergent
37	*Salix nigra*	Willow	Emergent
38	*Sesbania exaltata*	Hemp sesbania	Emergent
39	*Spermacoce glabra*	NONE	Emergent
40	*Spirodelia oligorrhiza*	Duckweed	Emergent
41	*Taxodium distichum*	Bald Cypress	Emergent
42	*Tripsacum dactyloides*	Gamma Grass	Emergent
43	*Xanthium strumarium*	Cocklebur	Emergent
44	*Zizanopsis miliacea*	Giant Cutgrass	Emergent

TABLE Q-11. continued

Associations listed in Table 12.

<u>Association V:</u>

No "most abundant" species
Cockelbur
Willow
Cutgrass
Erogrostis glomerata
Fimbristylis vahlii
Lippia nodiflora
Panicum dichotomiflorum
Lindernia anagallidia
Halberd-Leaved Marsh Mallow
Eclipta alba

<u>Association VI:</u>

No "most abundant" species
Marsh Fleabane
Alligator Weed
Erogrostis hypnoides
Erogrostis glomerata
Lindernia anagallidia
Gamma Grass
Cyperus erythrorhizos
Cyperus articulatus
Panicum dichotomiflorum
Panicum agrostoides
Lippia nodiflora
False Nettle

TABLE Q-12. Locations of Aquatic Macrophytes Observed Between R-17 and R-23 (Tombigbee River and Demopolis Lake), Middle Black Warrior and Tombigbee River August 1979

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	%	OTHER
279.7	L	Patch	Water Willow	100	
279.6	R	Patch	Water Willow	100	
279.5	L	Patch	Willow	100	
279.4	R	Strip	Water Willow	100	
278.6	L	Strips	Water Willow	100	
(278.0)	(L)	Noxubee River, right bank at mouth	Water Willow	100	
277.9	L	Strip	Water Willow	80	20
277.7	L	Patches	Water Willow	80	20
277.5	R	Patch	Bald Cypress	100	
276.9	R	Patches	Water Willow	60	41
276.6	R	Patch	Water Willow	100	
276.5	L	Under bridge	Water Willow	100	
276.2	L	Patches	Water Willow	100	
275.3	R	Strip	Water Willow	60	13,28,15
275.0	R	Patch	Water Willow	100	
274.8	R	Point at lock entrance	*Eragrostis glomerata*	50	43,27
274.7	R	Patch	NONE	--	Association V
274.5	L	Strip	NONE	--	Association V
274.5	R	Strip	NONE	--	Association V
274.0-273.6	L	Strip	NONE	--	Association V
273.7	R	Strip	NONE	--	Association V
(273.5)	(R)	Bank of slough	Halberd-leaved Marsh Mallow	100	
273.3	R	Strip	NONE	--	Association V
272.9	L	Strip	NONE	--	Association V
272.7	R	Strip	NONE	--	Association V
272.6-272.0	L	Strip	NONE	--	Association V
271.9-271.7	R	Strip	NONE	--	Association V
271.5	L	Strip	*Eragrostis glomerata*	100	
270.7-270.4	R	Strip	NONE	--	Association V
269.9-269.7	L	Strip	NONE	--	Associati[illegible] V

TABLE Q-12. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	%	OTHER
269.8	R	Strip	NONE	--	Association V
269.6	R	Strip	Water Willow	100	Association V
268.7-268.0	L	Strip	NONE	--	Association V
268.5	R	Strip	NONE	--	Association V
268.3	R	Mouth of inlet (D-4)	NONE	--	Association V
267.8-267.5	L	Strip	NONE	--	Association V
267.8-267.6	R	Strip	NONE	--	Association V
267.3	R	Patch	NONE	--	Association V
267.2-267.0	L	Strip	NONE	--	Association V
266.5-266.3	R	Strip	NONE	--	Association V
266.3	L	Strip	NONE	--	Association V
266.1	R	Strip	NONE	--	Association V
265.2	L	Small slough	Halberd-leaved Marsh Mallow	50	43,23
265.0	R	Strip	NONE	--	Association V
264.8-264.2	L	Patches	Water Willow	60	20
264.1	R	Strip	NONE	--	Association V
262.8	L	Strip	Water Willow	100	
260.5	L	Strip	NONE	--	Association V
260.0	R	Strip	NONE	--	Association V
259.9	L	Strip	NONE	--	Association V
259.7	R	Patch	Water Willow	100	
259.3	L	Strip	NONE	--	Association V
259.1-258.8	L	Strip	NONE	--	Association V
258.9	R	Strip	NONE	--	Association V
257.8	L	Mouth of upper creek	Halberd-Leaved Marsh Mallow	60	15
(257.8)	(L)	Bank of upper Creek	Alligator Weed	70	20
(257.8)	(L)	Point between creeks	*Eragrostis glomerata*	70	20

TABLE Q-12. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS: MOST ABUNDANT	%	OTHER
257.5-257.2	L	Patches	Water Willow	100	
256.8	L	Inlet	NONE	--	Association V
256.8-256.3	R	Strip	NONE	--	Association V
256.2	L	Inlet	NONE	--	Association V
255.7	R	Inlet	NONE	--	Association V
255.1	R	Inlet	NONE	--	Association V
254.8	R	Inlet	NONE	--	Association V
254.7	R	Strip	NONE	--	Association V
254.5	R	Patch	NONE	--	Association V
254.0	R	Patch	NONE	--	Association V
253.8	L	Strip	NONE	--	Association V
253.4-253.0	R	Strip	NONE	--	Association V
253.0	L	Strip	NONE	--	Association V
252.5	R	Inlet	NONE	--	Association V
252.2	R	Inlet	NONE	--	Association V
250.7	L	Inlet	NONE	--	Association V
250.4	L	Inlet	NONE	--	Association V
250.1	L	Inlet	Bald Cypress	60	20
249.9	L	Strip	NONE	--	Association V
248.8	R	Inlet	NONE	--	Association V
247.9	L	Strip	NONE	--	Association V
247.3	R	Strip	NONE	--	Association V
247.2	L	Inlet	NONE	--	Association V
246.9	L	Strip	NONE	--	Association V
246.6	L	Strip	NONE	--	Association V
246.1	L	Slough	NONE	--	Association V + 1
245.7-245.2	R	Strip	NONE	--	Association V
244.0	R	Strip	NONE	--	Association V
243.9	L	Strip	NONE	--	Association V
243.8	L	Inlet	NONE	--	Association V
243.2	L	Strip	NONE	--	Association V + 14,23,11
243.0	R	Strip	NONE	--	Association V
242.8-242.1	L	Patches and strip	Water Willow	100	

TABLE Q-12. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	%	OTHER
241.9	R	Patch	Halberd-leaved Marsh Mallow	100	
241.4	L	Strip	Cockle bur	60	20,23
241.3-					
241.0	L	Patches	Water Willow	100	
240.9	R	Inlet	NONE	--	Association V
240.5	L	Inlet	NONE	--	Association V
239.9	L	Strip	NONE	--	Association V
238.2	L	Inlet	NONE	--	Association V
238.0	L	Patch	Water Willow	70	31
237.9	R	Strip	NONE	--	Association V
237.8	L	Inlet	NONE	--	Association V
(236.0)	(R)	Large slough	Water Willow	50	Association V
(235.8)	(R)	Small slough	NONE	--	Association V + 23
234.7	L	Strip	NONE	--	Association V
233.3	R	Strip	NONE	--	Association V
233.0	R	Inlet	NONE	--	Association V
232.9	L	Patch	Water Willow	100	
232.3	R	Strip	NONE	--	Association V
232.2	R	Patch	NONE	--	Association V
232.0-					
231.5	R	Strip	NONE	-	Association V
231.5-					
231.2	L	Strip	NONE	--	Association VI
231.3	R	Upriver side of creek mouth	NONE	--	Association V
(231.3)	(R)	McConnico Creek, banks	Water Willow	60	20,37,24,42,30
(231.0)	(R)	Slough	Alligator Weed	50	Association V + 12
230.8	R	Strip	NONE	--	Association V + 12
230.7-					
230.3	R	Strip	NONE	--	Association V
230.7-					
230.2	L	Strip	NONE	--	Association VI
(230.1)	(R)	Slough	Alligator Weed	60	Association V
230.0-					
229.8	R	Patches	Water Willow	100	
229.9	L	Patch	NONE	--	Association VI
229.6	R	Patch	NONE	--	Association V + 23

TABLE Q-12. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS: MOST ABUNDANT	%	OTHER
229.5	L	Strip	NONE	--	Association VI
(229.2)	(R)	Slough	NONE	--	Association V + 23
228.9	L	Strip	NONE	--	Association VI + 9
228.8-					
228.5	L	Strip	NONE	--	Association VI
228.5	R	Patches	Water Willow	100	
(228.4)	(R)	Left bank of co-op canal	Cutgrass (*Leersia*)	40	42,23,31,38,20,4
228.3	R	Patches at canal entrance	NONE	--	Association V + 23
228.0	R	Sloughs	Cocklebur	40	23,4,15,20,37,38,41
227.8	L	Slough and shore	NONE	--	Association VI
227.7-					
227.1	R	Strip	Cocklebur	40	4,38,15,42
227.4	L	Strip	NONE	--	Association VI
227.1	L	Strip	NONE	--	Association VI
227.0	R	Strip	Cocklebur	40	4,38,15,42
226.9-					
226.5	L	Strip	NONE	--	Association VI
226.4	L	Strip	NONE	--	Association VI + 9
226.3	R	Strip	Sicklepod	40	38,43,15,42
226.0-					
225.8	L	Strip	NONE	--	Association VI + 9
225.6	L	Strip	Hemp Sesbania	50	4,43,15,42
225.5-					
224.3	R	Strip	Cocklebur	50	38,4,42,3
225.3	L	Strip	NONE	--	Association VI
225.0	L	Strip	Cocklebur	40	4,38,33,42,15
224.8	L	Strip	Cocklebur	40	4,38,33,42,15
224.6 -					
224.2	L	Strip & slough mouth	Sicklepod	40	38,15,43,42
224.0	R	Strip	NONE	--	Association V
223.9 -					4,24,20,15,42,26,34,25
223.1	L	Strip	Cocklebur	40	22,29,32,39
223.2 -	R	Patch	NONE	--	Association V
222.9	R	Patch	NONE	--	Association V
(222.8)	(L)	Right bank of creek (D-5)	Water Willow	60	24,15,20,41,5

TABLE Q-12. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS: MOST ABUNDANT	%	OTHER
(222.8)	(L)	Left bank of creek (D-5)	Water Willow	100	
222.6	R	Strip	NONE	--	Association V
222.3	R	Strip	Cutgrass (*Leersia*)	40	38,4,15,10,26,19,33,20
221.9-221.7	L	Strip	Cutgrass (*Leersia*)	60	25,2,19,18,12,23,26,15,42,20,21,17,8,10
221.8	R	Patch	NONE	--	Association V
221.5-221.0	R	Strip and small sloughs	Alligator Weed	50	Association V
221.2-220.8	L	Strip on sand bar	NONE	--	23,25,15,43,12,19,26,16,27,44,35
221.0-220.8	R	Strip	NONE	--	Association V
220.7	L	Patch	Water Willow	100	
(220.5)	(R)	Slough	Alligator Weed	50	Association V
220.3	L	Strip	*Eragrostis glomerata*	40	12,25,20,23,43
220.1	R	Strip	Alligator Weed	50	37,15,24,27,43,2,25,29,33,20,11
219.8	L	Strip	NONE	--	Association V
219.7-219.4	R	Strip and slough	Alligator Weed	50	Association V
219.2-218.8	L	Strip and slough mouth	Alligator Weed	60	Association V
(218.8)	(L)	Slough	Bald Cypress	100	
218.8-218.6	L	Strip	NONE	--	Association V
218.4-217.8	R	Strip	Water Willow	40	Association V
217.8	L	Strip	NONE	--	Association V
(217.6)	(R)	Slough	Water Willow	40	Association V
217.5	L	Patch	Water Willow	100	
217.3	R	Patch	Alligator Weed	50	15,37,20,23
217.0	L	Patch	Water Willow	80	44
(216.8)	R	Slough	Alligator Weed	80	44,15,23,20
216.8-216.1	R	Strip	Alligator Weed	70	44,23,20
216.3-215.7	L	Strip	Giant Cutgrass	50	23,13,41,20

TABLE Q-12. continued

RIVER MILE	BANK	DESCRIPTION	PLANTS MOST ABUNDANT	%	OTHER
(216.1)	(R)	Slough at US-43	Alligator Weed	80	23,44,20
216.0	R	Near boat ramp	Water Willow	100	
215.4	R	Slough (Small)	Alligator Weed	60	44,20,23,36
215.4	L	Strip	Giant Cutgrass	60	23,20,15
215.3	R	Patch	Giant Cutgrass	50	15,1
215.2-214.0	L	Strip	Giant Cutgrass	70	23,20
(215.1)	(R)	Left Bank of old canal	Water Willow	50	44,20
215.0	R	Patch	Giant Cutgrass	70	23,20
214.8	R	Patches	Water Willow	100	
214.6	R	Patch	Giant Cutgrass	70	23,20
(214.2)	(R)	Upriver side of creek mouth	NONE	--	15,20,16,12,25,2,27,1,42
(214.2)	(R)	Foscue Creek, left slough	Alligator Weed	50	20,23
(214.2)	(R)	Foscue Creek, right slough (boat ramp)	Alligator Weed	70	20,23
(214.2)	(R)	Foscue Creek, right bank, patches	Water Willow	100	
214.1	R	Between Foscue Creek and slough	NONE	--	15,20,16,12,25,2,27,42
(214.0)	(R)	Back of slough	Water Willow	60	24
(214.0)	(R)	Right bank of slough, patches	Water Willow	100	
214.0	R	Downriver side of slough mouth	Water Willow	50	44,42,20,5
(213.9)	(L)	Large slough	Alligator Weed	90	44,20,23,11,24
213.8-213.4	L	Strips	Giant Cutgrass	70	23,20
(213.7)	(L)	Large slough	Alligator Weed	90	44,20,23,11,24